



AGRICULTURAL RESEARCH INSTITUTE
PUSA

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY'.)

CONDUCTED BY
ALBERT C. L. G. GÜNTHER, M.A., M.D., Ph.D., F.R.S.,
WILLIAM CARRUTHERS, F.R.S., F.L.S., F.G.S.,
AND
WILLIAM FRANCIS, Ph.D., F.L.S.

VOL. XIX.—SIXTH SERIES.

LONDON:

PRINTED AND PUBLISHED BY TAYLOR AND FRANCIS.

SOLD BY SIMPKIN, MARSHALL, HAMILTON, KENT, AND CO., LD. ;
WHITTAKER AND CO.: BAILLIÈRE, PARIS:
MACLACHLAN AND STEWART, EDINBURGH:
HODGES, FIGGIS, AND CO., DUBLIN: AND ASHER, BERLIN.

1897.

"Omnes res creatæ sunt divinis sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum una *bonitas* Creatoris; ex pulchritudine *sapientiæ* Domini; ex œconomiâ in conservatione, proportionè, renovatione, *potentiâ* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstinata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. The sylvan powers
 Obey our summons; from their deepest dells
 The Dryads come, and throw their garlands wild
 And odorous branches at our feet; the Nymphs
 That press with nimble step the mountain-thyme
 And purple heath-flower come not empty-handed,
 But scatter round ten thousand forms minute
 Of velvet moss or lichen, torn from rock
 Or rifted oak or cavern deep: the Naiads too
 Quit their loved native stream, from whose smooth face
 They crop the lily, and each sedge and rush
 That drinks the rippling tide: the frozen poles,
 Where peril waits the bold adventurer's tread,
 The burning sands of Borneo and Cayenne,
 All, all to us unlock their secret stores
 And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.



CONTENTS OF VOL. XIX.

[SIXTH SERIES.]

NUMBER CIX.

	Page
I. A new Amphipod from New Zealand (Family <i>Pontoporeiidae</i>). By CHARLES CHILTON, M.A., D.Sc., F.L.S. (Plate V.).....	1
II. Descriptions of new Lizards and Frogs from Mount Victoria, Owen Stanley Range, New Guinea, collected by Mr. A. S. Anthony. By G. A. BOULENGER, F.R.S. (Plates I. & II.)	6
III. Descriptions of Four new Species of <i>Lycanidae</i> from the Eastern Archipelago. By HAMILTON H. DRECE, F.Z.S., F.E.S. ..	13
IV. Contributions from the New Mexico Biological Station.— No. 2. On a Collection of Diptera from the Lowlands of the Rio Nautla, in the State of Vera Cruz. I. By C. H. TYLER TOWNSEND, F.E.S.	16
V. The Classification of <i>Oribatida</i> . By A. D. MICHAEL, F.L.S.	34
VI. Contributions from the New Mexico Biological Station.— III. The Bees of the Genus <i>Colletes</i> found in New Mexico. By T. D. A. COCKERELL	39
VII. On Cteniform Spiders from the Lower Amazons and other Regions of North and South America, with List of all known Species of these Groups hitherto recorded from the New World. By F. O. PICKARD CAMBRIDGE, B.A. (Plates III. & IV.)	52
VIII. Descriptions of new Malay Frogs. By G. A. BOULENGER, F.R.S.	106
IX. On some Trapdoor Spiders of the Family <i>Ctenizidae</i> from South and West Australia, contained in the Collection of the British Museum. By R. I. POOCK	109
X. Descriptions of two new Species of Scorpions from East Africa. By R. I. POOCK	116

	Page
Proceedings of the Geological Society	119
"The most pious priority purist" on the Lobster, the Crayfish, and Professor Bell, by the Rev. Thomas R. R. Stebbing, M.A., F.R.S., F.L.S.; Note on some Sponges from the Auckland Islands, by Prof. R. von Lendenfeld; On the Sexes of <i>Charaxes mixtus</i> , Rothschild, by A. G. Butler, Ph.D., &c.	120-124

NUMBER CX.

XI. On a Collection of Homoptera made in Southern Africa. By W. L. DISTANT	125
XII. A Contribution to the Biology of the Social Wasps of Brazil. By H. VON IHERING	133
XIII. Contributions from the New Mexico Biological Station.—No. IV. Diptera from the Sacramento and White Mountains, in Southern New Mexico. I. By C. H. TYLER TOWNSEND	138
XIV. The Physiological Importance of the Air-Spaces in Flying Animals. By Prof. R. VON LENDENFELD	149
XV. Description of a new Snake from Sierra Leone. By G. A. BOULENGER, F.R.S.	154
XVI. Description of a new Fish from Lake Nyassa. By G. A. BOULENGER, F.R.S.	155
XVII. On Movement in a Circle as the Fundamental Form of Movement in Animals: its Cause, Manifestation, and Significance. By Prof. F. O. GULDBERG	156
XVIII. On the Tsu-shima Representative of the Japanese Sable. By OLDFIELD THOMAS	161
XIX. On a new Gazelle from Central Arabia. By OLDFIELD THOMAS	162
XX. New Eastern Heterocera. By Col. C. SWINHOE, M.A., F.L.S.	164
XXI. Description of a new Species of <i>Delma</i> from Western Australia. By Dr. A. GÜNTHER	170
XXII. Descriptions of new Species of Butterflies from the Pacific Islands. By H. GROSE SMITH, B.A., F.E.S., F.Z.S.	172
XXIII. On Lepidoptera Heterocera from China, Japan, and Corea. By JOHN HENRY LERCH, B.A., F.L.S., F.Z.S., &c.	180
<i>New Books</i> :—The Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by W. T. BLANFORD.—Moths. Vol. IV. By Sir G. F. HAMPSON, Bart.—The Parasitic Diseases of Poultry. By FRED. V. THROBOLD, M.A., F.E.S.	236, 237

	Page
Proceedings of the Geological Society	238
The Generic Name of the River Crayfish, by F. Jeffrey Bell; A Gigantic Cephalopod on the Florida Coast, by A. E. Verrill	239, 240

NUMBER CXI.

XXIV. Notes from the Gatty Marine Laboratory, St. Andrews.— No. XVII. By Prof. M'INTOSH, M.D., LL.D., F.R.S.	241
XXV. New Species of Hymenoptera from Central America. By P. CAMERON, F.E.S.	261
XXVI. A List of Reptiles and Batrachians from the Congo Free State, with Descriptions of Two new Snakes. By G. A. BOULENGER, F.R.S.	276
XXVII. Description of a new Snake from Usambara, German East Africa. By G. A. BOULENGER, F.R.S.	281
XXVIII. Description of a new Species of the Genus <i>Pacilopsaltria</i> belonging to the Family <i>Cicadidae</i> . By W. L. DISTANT.	282
XXIX. Descriptions of some new Oriental <i>Opiliones</i> recently received by the British Museum. By R. I. Pocock	283
XXX. A Contribution to the Osteology of the Mesozoic Amioid Fishes <i>Caturus</i> and <i>Osteorachis</i> . By A. SMITH WOODWARD, F.L.S. (Plates VIII. & IX.)	292
XXXI. On Lepidoptera Heterocera from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c.	297
XXXII. On a new Mouse from Damaraland. By W. E. DE WINTON	349
Proceedings of the Geological Society	350, 351

What are the Names of the Crayfish and Lobster?, by R. I. Pocock; The Lobster and the Crayfish: a Reply, by the Rev. Thomas R. R. Stobbing, M.A., F.R.S., F.L.S.; Nocturnal protective Coloration in Mammals, Birds, Fishes, Insects, &c., as developed by Natural Selection, by A. E. Verrill	352-354
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------

NUMBER CXII.

XXXIII. Report upon the Scorpiones and Pedipalpi obtained on the Lower Amazons by Messrs. E. E. Austen and F. Pickard Cam- bridge during the trip of Mr. Siemens's Steamship 'Faraday.' By R. I. Pocock	357
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----

	Page
XXXIV. New Species of Hymenoptera from Central America. By P. CAMERON, F.E.S.	368
XXXV. A Contribution to the Osteology of the Mesozoic Amioid Fishes <i>Caturus</i> and <i>Osteorachis</i> . By A. SMITH WOODWARD, F.L.S. (Plates X. & XI.)	379
XXXVI. On a new Dormouse from Mashunaland. By OLDFIELD THOMAS	388
XXXVII. Note on <i>Deridea</i> , Westwood (<i>Lyttidae</i>), with the Description of a new Species. By Mrs. M. K. THOMAS.	380
XXXVIII. On a Collection of Heterocera made in the Transvaal. By W. L. DISTANT.	390
XXXIX. Contributions from the New Mexico Biological Station. —V. Some new Hymenoptera from the Mesilla Valley, New Mexico. By T. D. A. COCKERELL	394
XI. Descriptions of further new Species of Butterflies from the Pacific Islands. By H. GROSE SMITH, B.A., F.G.S., F.Z.S.	403
XI.I. New Eastern Lepidoptera. By Col. C. SWINHOE, M.A., F.L.S.	407
XI.II. On <i>Spirorbis</i> : Asymmetry of these Annelids and Phylo- genic Connexion of Species in the Genus. By MM. MAURICE CAULLERY and FÉLIX MESNIL. With a Note by M. EDMOND PERRIER	411
XLIII. On Lepidoptera Heterocera from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c. (Plates VI. & VII.)	414
XLIV. Descriptions of Two new <i>Muride</i> from Central and West Africa. By W. E. DE WINTON	463
XLV. On a new Species of <i>Lagidium</i> from the Eastern Coast of Patagonia. By OLDFIELD THOMAS	466
XLVI. Description of a new Lizard from Obok. By G. A. BOULENGER, F.R.S.	467
XLVII. Description of a new Genus and Species of Tortoises from Borneo. By G. A. BOULENGER, F.R.S.	468
XLVIII. On a new Nymphalid Butterfly from N.E. Borneo. By ARTHUR G. BUTLER, Ph.D., F.L.S., F.Z.S., Senior Assistant-Keeper, Zoological Department, British Museum	469
<i>Astacus</i> vindicated as the Lobster's Genus, by the Rev. Thomas R. R. Stebbing, M.A., F.R.S., F.L.S.	470

NUMBER CXIII.

	Page
XLIX. Notes on the Longicorn Genus <i>Glenea</i> , Newm., with Descriptions of new Species. By C. J. GAHAN, M.A., of the British Museum (Natural History)	473
L. Notes on some South-American <i>Muride</i> . By OLDFIELD THOMAS	494
LI. Descriptions of Five new Species of <i>Mylabrinæ</i> (<i>Lyttidæ</i>) in the Collection of the British Museum. By MRS. M. K. THOMAS ..	501
LII. A List of the Reptiles and Batrachians collected by Mr. Alfred Everett in Lombok, Flores, Sumba, and Savu, with Descriptions of new Species. By G. A. BOULENGER, F.R.S.	503
LIII. Descriptions of some new Species of Scorpions of the Genus <i>Tityus</i> , with Notes upon some Forms allied to <i>T. americanus</i> (Linn.). By R. I. Pocock	510
LIV. On <i>Sus verrucosus</i> , Müll. & Schleg., and Allies, from the Eastern Archipelago. By Dr. C. I. FORSYTH MAJOR	521
LV. On Lepidoptera Heterocera from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c.—Part II. Family <i>Geometridæ</i> ; Subfamilies <i>Euchrominæ</i> , <i>Orthostixinæ</i> , <i>Larentiinæ</i> , <i>Acidalinæ</i> , and <i>Geometrinæ</i>	543
LVI. The Ochre-footed Scrub-Squirrels of East Africa. By W. E. DE WINTON	573
LVII. Coleoptera collected in the Transvaal. By W. L. DISTANT.	575
LVIII. On a Collection of Heterocera made in the Transvaal. By W. L. DISTANT	579
LIX. Descriptions of some new Species of <i>Acreeidæ</i> collected by Mr. F. J. Jackson at Ntebi, Uganda. By EMILY MARY SHARPE ..	581
On the Organization and Affinities of <i>Pleurotomaria</i> , by MM. E.-L. Bouvier and H. Fischer	583

NUMBER CXIV.

LX. Note on a Cast of the Brain-cavity of <i>Iguanodon</i> . By CHAS. W. ANDREWS, B.Sc., F.G.S., Assistant in the British Museum (Natural History). (Plate XVI.)	585
LXI. Ostracoda from the <i>Chara</i> -marl of Hitchin, Herts. By FREDERICK CHAPMAN, A.L.S., F.R.M.S. (Plate XV.)	591
LXII. List of the Neuroptera collected by Mr. E. E. Austen on the Amazons &c. during the recent Expedition of Messrs. Siemens Bros. Cable S.S. 'Faraday,' with Descriptions of several new Species of Odonata (Dragonflies). By W. F. KIRBY, F.L.S., F.E.S., &c. (Plates XII. & XIII.)	598

	Page
LXIII. The Otter of Central America. By O. I. FORSYTH MAJOR	618
LXIV. On the Relations of <i>Antennophorus Uhlmanni</i> , Haller, to <i>Lasius mixtus</i> , Nyl. By M. CHARLES JANET	620
LXV. Diagnoses of new Land-Shells from Flores, Malay Archipelago. By EDGAR A. SMITH	623
LXVI. On a new African Pierine Butterfly of the Genus <i>Mylothris</i> . By ARTHUR G. BUTLER, Ph.D. &c.	627
LXVII. Some new Forms of American Rotifera.—II. By Dr. ALFRED C. STOKES. (Plate XIV.)	628
LXVIII. Descriptions of Eleven new Species of Land and Fresh-water Mollusca from South Africa. By JAMES COSMO MELVILL, M.A., F.L.S., and JOHN HENRY PONSONBY, F.Z.S. (Plate XVII.)	633
LXIX. On Lepidoptera Heterocera from China, Japan, and Corea. By JOHN HENRY LERCH, B.A., F.L.S., F.Z.S., &c.—Part II. Family <i>Geometridæ</i> ; Subfamilies <i>Euechrominæ</i> , <i>Orthostixinæ</i> , <i>Larentiinae</i> , <i>Acidaliinae</i> , and <i>Geometrinæ</i>	640
<i>New Book</i> :—Das Tierreich. I. Lieferung.—Aves: <i>Podargidæ</i> , <i>Caprimulgidæ</i> , and <i>Macropterygidæ</i> . Bearbeitet von ERNST HARTERT	679
On the Malpighian Tubes of Orthoptera, by M. L. BORDAS; The supposed great Octopus of Florida: certainly not a Cephalopod, by A. E. VERRILL	680-682
Index	684

PLATES IN VOL. XIX.

PLATE I.	{	New Lizards and Frogs from Mount Victoria.
II.		
III.	{	Cteniform Spiders from the Lower Amazons.
IV.		
V.		<i>Platyischnopus neozelanicus</i> .
VI.	{	Heterocera from China, Japan, Corea.
VII.		
VIII.	{	Osteology of <i>Caturus</i> .
IX.		
X.	{	<i>Osteorachis Leedsi</i> .
XI.		
XII.	{	Neuroptera from the Amazons.
XIII.		
XIV.		New American Rotifera.
XV.		Ostracoda from the Chars-marl of Hitchin.
XVI.		Brain-cavity of <i>Iguanodon</i> .
XVII.		New Mollusca from South Africa.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SIXTH SERIES.]

"..... per litora spargite muscum,
Naiades, et circum vitrea considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Des pelagi, et pingui conchylia succo."
N. Partheni Giannettasi, Bol. I.

No. 109. JANUARY 1897.

I.—*A new Amphipod from New Zealand (Family Pontoporeiidae).* By CHARLES CHILTON, M.A., D.Sc., F.L.S.

[Plate V.]

THE genus *Platyischnopus* was established in 1888 by the Rev. T. R. R. Stebbing, in his Report on the 'Challenger' Amphipoda, for a species two imperfect specimens of which were obtained in Port Jackson at a depth of between 2 and 10 fathoms. The genus was placed provisionally in the family Pontoporeiidae, but at the same time it was pointed out that "the combined characters of its peculiar head, the chelate gnathopods, and the emarginate telson, give it a more or less isolated position among the Amphipoda at present known" *.

I find that I have a species in my collection of New Zealand Crustacea that appears to come under this genus, although it differs in some points, as explained further on. It is represented, however, by only a single specimen taken in Otago Harbour by surface-netting on the night of September 19th, 1891. The specimen was at the time partially

* Report on the 'Challenger' Amphipoda, p. 830.

dissected and permanently mounted before it was recognized that it was the only specimen taken of a new and rare genus. Unfortunately pressure of other matters caused it to be laid aside, and it has remained long overlooked. Consequently there are many points that cannot now be satisfactorily made out by an examination of the mounted specimen. I think, however, that sufficient can be learnt to show that, although in many respects the specimen closely resembles Stebbing's species *Platyischnopus mirabilis*, it differs considerably in others, and that these points of difference throw some further light on the affinities of the genus, and I have therefore thought it worth while to place a description of the species on record.

Platyischnopus neozelanicus, sp. n. (Pl. V.)

Specific description.—The head and antennæ resembling in general shape those of *P. mirabilis*. Second joint of peduncle of upper antennæ and last two joints of the peduncle of the lower with long feathered setæ. Both gnathopoda stouter than in *P. mirabilis*, the first apparently ending simply, the dactylos not impinging against the propodos; the second minutely chelate, the dactylos being small and short and impinging against a spine-like projection of the propodos. The first and second peræopoda with the end of the propodos oblique and bearing several spine-like setæ longer than the dactylos; the carpus of the second peræopoda expanded posteriorly and supplied with several long feathered setæ. Third uropoda with the rami longer than the peduncle, subequal, outer one formed of two joints, both rami bearing long feathered setæ at the extremity. Telson double or very deeply cleft, each half with a stout spine at the end and two setæ at the side some distance from the end.

Length about 4 millim.

Hab. Otago Harbour, New Zealand.

Detailed description.—The *head*, in its peculiar shape and in the position of the antennæ, closely resembles that of *P. mirabilis*.

The *body* is rather broad, chiefly so in the peræon.

The *upper antennæ* (Pl. V. fig. a.s.) are somewhat shorter than the lower; the peduncle considerably longer than the flagellum, the first joint stout, broader than long, with two or three small setæ at the distal end; second joint oblong, about twice as long as broad, distally furnished with four or five long feathered setæ which reach as far as the end of the flagellum; the third joint rather more than half as long as

the second; secondary flagellum about half as long as the primary, and composed of three joints, while the primary contains five.

The *lower antennæ* (fig. *a.i.*) have the peduncle very stout, the fourth joint slightly longer than the fifth, fully twice as long as broad; upper margin with three fine setæ, lower margin with some fine setæ and, in addition, six long feathered setæ; fifth joint slightly shorter than the preceding and considerably narrower, upper margin with several fine setæ and at the distal end one long feathered seta; lower margin with three or four feathered setæ near the middle and one placed distally; flagellum imperfect, apparently about as long as the last joint of the peduncle.

Mouth-parts not examined in detail.

The *first gnathopod* (fig. *gn. 1*) has the basos very long and slender, expanding slightly distally, end with two long setæ; carpus much longer than the propodos, upper margin regularly convex and free from setæ, lower margin sinuous, slightly produced downwards, and thickly fringed with setæ except near the base; propodos narrow at base, expanded distally, lower margin thickly fringed with long setæ; at the base of the dactylos is a tuft of three or four long setæ fully twice as long as the dactylos; no distinct palm visible, the gnathopod being apparently simple.

The *second gnathopod* (fig. *gn. 2*) similar in general shape to the first, but somewhat longer; propodos only about half as long as the carpus, produced distally into a small tooth, against which the very short dactylos impinges; the other joints and the arrangement of the setæ practically the same as in the first gnathopod.

The integument of the propodos in both gnathopods seems to be very delicate and is somewhat shrivelled in my mounted specimen; hence I have not been able to make these parts out as fully as I should like, but it is clear that the first is not chelate and little, if at all, subchelate, and that the second, though certainly chelate, has the dactylos so short that it is very different from the well-marked chelate limb of *P. mirabilis*.

The *first pereopod* (fig. *prp. 1*) has the meros somewhat produced at its antero-distal angle, its hinder margin with three long feathered setæ; the carpus only about two thirds the length of the meros, bearing posteriorly at the end one long feathered seta and two spiniform setæ; propodos rather longer than the carpus, end oblique, with about six spiniform setæ, from which the dactylos can be distinguished only by being shorter and a little stouter.

The *second peraeopod* (fig. *prp.* 2) similar to the first, but rather longer, having the carpus produced posteriorly into a rounded lobe, which bears about six long feathered setae reaching beyond the end of the dactylos.

The *third peraeopod* (*prp.* 3) has the basos widening distally and at the widest part as broad as long, anterior border with small tufts of short spiniform setae; the meros broad, produced posteriorly, both margins with tufts of spiniform setae; carpus half as long again as the meros and about as broad, similarly supplied with spiniform setae; propodos about two thirds the length of the carpus, but much narrower, with one tuft of spiniform setae on each margin and others at the end; dactylos straight and styliform, about two thirds as long as the propodos.

The *fourth peraeopod* does not differ in any important character from the third.

The *fifth peraeopod* (fig. *prp.* 5) is considerably broader and somewhat shorter than the third; the basos is much broader than long, the ischium large and broad, its breadth being more than half the greatest breadth of the basos; meros broad, oblong, only slightly narrowed at base, anterior margin with setae at the end only, posterior margin with four or five slender setae, and towards the distal end two or three short spines; carpus as broad as the meros, narrowed at base, anterior margin with two transverse rows of spines and one row at the end; posterior margin with one row at the middle and another at the end; propodos about as long as the carpus but only half the width, with a tuft of spines about the middle of each margin and others at the end; dactylos straight, styliform.

The *first uropod* (fig. *ur.* 1) has the peduncle longer than the rami, with two strong spines at the distal end, otherwise nearly free from setae; outer ramus slightly longer than the inner, with a tuft of four or five stout setae at the end, sides parallel and free from setae; inner ramus with a similar tuft of setae at the end and one seta a little removed from the end.

The *second uropod* (fig. *ur.* 2) has the peduncle stout, as long as the outer ramus, with three setae in serrations on the upper margin; outer ramus considerably longer than the inner, both with tufts of setae at the ends and the outer one with an additional seta on the upper margin.

The *third uropod* (fig. *ur.* 3) has the peduncle much shorter than the rami, bearing a few setae, and at the end one feathered seta reaching to the end of the rami; outer ramus slightly longer than the inner, with the distal third marked

off as a separate joint, the ramus bears a few fine setæ, and at the end two long feathered setæ; the inner ramus also bears two or three long feathered setæ at the extremity*.

The *telson* (fig. T) is either double or very deeply cleft, each half about twice as long as broad, narrowing slightly towards the end, and apparently partly rolled up so as to be convex above; at the end is a stout spine and on the upper surface two smaller ones placed towards the outer margin and at some distance from the distal end.

The two halves of the telson are separated on my slide, and it is possible that fig. T, Pl. V., in which the left half has been restored, does not give a correct idea of their natural position, and that the inner margins should be more closely approximated.

Remarks.—While the imperfect condition of the specimen described leaves much of its structure still uncertain, the points that can be made out are, perhaps, of some importance in their bearing on the systematic position of the genus *Platyischnopus*. It is evident, too, that in the gnathopoda and in the telson this species differs markedly from *P. mirabilis* and also from the characters laid down by Stebbing for the genus; but the resemblances in other respects are so close that there is no doubt of the near relationship of the two species, and they may as well stand together until the genus is better known and its limits clearly defined. Further, the points in which *P. neozelandicus* differs from *P. mirabilis* bring it more into harmony with other allied species, and seem to show that Stebbing was undoubtedly right in placing his genus in the family Pontoporeiidae. Stebbing has already pointed out the relationship of *Platyischnopus* to *Urothoë* as shown by the peræopods, and in the present species we find in the gnathopoda also some approximation to *Urothoë*; this is best seen in the first gnathopod, though the limb appears to be simple instead of subchelate: the second gnathopod differs from that of *Urothoë* in being chelate, but the chelate character is not very marked, and from the figure given by Stebbing it seems as if we get a slight approach in the same direction in *Urothoë pulchella*, Costa †; and it is, perhaps, as well to recall the fact that Costa described and figured the second gnathopod of this species as having the

* In the present dissected state of my specimen there is nothing to indicate which is the outer ramus in the uropoda; but from the analogy of *Urothoë* &c. I have assumed that it is the outer one that is the longer in each case.

† Stebbing, "On the Genus *Urothoë* and a new Genus *Urothoides*," Trans. Zool. Soc. London, vol. xiii. pt. 1 (1891) pl. iv. A, gn. 2.

hand produced into a tooth confronting the finger, though Stebbing supposes that this was due to a misapprehension*.

A further approach to *Urothoë* is perhaps to be seen in the long feathered setæ found in the present species on the antennæ, the first and second peræopods, and the third uropods, though they do not seem to occur on the third and fourth peræopods, where they are most abundant in *Urothoë*. The terminal uropods and the telson show a fairly close connexion with *Phoxocephalus* as well as with *Urothoë* and *Urothoides*, and the general shape of the head has somewhat the characters of *Phoxocephalus*, though in a much exaggerated degree.

In the telson this species evidently differs very considerably from the 'Challenger' species (where the telson is undivided and emarginate), and presents a fair general resemblance to *Urothoë* and allied genera.

EXPLANATION OF PLATE V.

Platyischnopus neozelandicus, sp. n.

- | | |
|--------------------------------|-------------------------------|
| a.s. Upper antenna, × 50. | prp. 3. Third peræopod, × 50. |
| a.i. Lower antenna, × 50. | prp. 5. Fifth peræopod, × 50. |
| gn. 1. First gnathopod, × 50. | ur. 1. First uropod, × 50. |
| gn. 2. Second gnathopod, × 50. | ur. 2. Second uropod, × 50. |
| prp. 1. First peræopod, × 50. | ur. 3. Third uropod, × 50. |
| prp. 2. Second peræopod, × 50. | T. Telson, × 50. |

17 Melville Terrace, Edinburgh,
5th October, 1896.

II.—*Descriptions of new Lizards and Frogs from Mount Victoria, Owen Stanley Range, New Guinea, collected by Mr. A. S. Anthony.* By G. A. BOULENGER, F.R.S.

[Plates I. & II.]

Lygosoma nigrolineatum. (Pl. I. fig. 1.)

Section *Hinulia*. Body moderately elongate, limbs rather short; the distance between the end of the snout and the fore limb contained once and a half in the distance between axilla and groin. Snout short, obtuse. Lower eyelid scaly. Nostril pierced in a single nasal; no supranasal; frontonasal broader than long, forming a suture with the rostral and with the frontal; latter a little shorter than frontoparietals and

* L. c. p. 4.

interparietal together, in contact with the two anterior supraoculars; four supraoculars; eight supraciliaries; frontoparietals and interparietal distinct, subequal in length; parietals forming a suture behind the interparietal; six pairs of nuchals; fifth upper labial below the centre of the eye. Ear-opening oval, a little smaller than the eye-opening; no auricular lobules. 28 smooth scales round the body, laterals smallest, the two vertebral series much enlarged, more than twice as broad as long, here and there fused to a single plate-like scale five or six times as broad as long. A pair of large præanals. The adpressed hind limbs just meet. Digits short, feebly compressed; subdigital lamellæ smooth, mostly divided, 18 under the fourth toe. Tail thick, tapering to a fine point, a little longer than head and body. Brown above, with a broad black dorso-lateral stripe extending from the posterior corner of the eye to the middle of the tail, and separated from its fellow by four and two half scales; each of the four scales between the stripes with a black spot or median streak, these spots and streaks confluent into four interrupted dorsal lines; sides of head and body greyish, speckled and spotted with black; lower parts white, throat and tail speckled with black.

	millim.
Total length.....	127
Head.....	13
Width of head.....	8
Body.....	46
Fore limb.....	12
Hind limb.....	20
Tail.....	70

A single specimen.

Lygosoma Stanleyanum. (Pl. I. fig. 2.)

Section *Lirolepisma*. Body moderately elongate, limbs moderate; the distance between the end of the snout and the fore limb contained once and a half in the distance between axilla and groin. Snout short, obtuse. Lower eyelid with an undivided transparent disk. No supranasal; frontonasal much broader than long, forming a suture with the rostral and with the frontal; latter a little longer than the single frontoparietal, in contact with the first and second supraoculars; four supraoculars; eight supraciliaries; parietals forming a suture behind the interparietal; three pairs of nuchals; fifth upper labial entering the orbit. Ear-opening oval, smaller than the eye-opening; no auricular lobules.

32 smooth scales round the body, the two vertebral series largest, at least twice as broad as long. A pair of large præanals. The hind limb reaches the elbow of the adpressed fore limb. Digits moderate, feebly compressed; subdigital lamellæ smooth, 25 under the fourth toe. Tail once and a half as long as head and body. Dark brown above, with a broad lateral band formed by the crowding of black spots; this band light-edged above on the head and anterior part of body; flanks greenish white, dotted with black; lower parts greenish white.

	millim.
Total length	150
Head	11
Width of head	8
Body	49
Fore limb	18
Hind limb.	26
Tail	90

A single specimen.

Lygosoma elegans. (Pl. I. fig. 3.)

Section *Liolepisma*. Habit lacertiform; the distance between the end of the snout and the fore limb contained once and one fourth in the distance between axilla and groin. Snout moderate, pointed. Lower eyelid with an undivided transparent disk. No supranasal; frontonasal broader than long, forming a suture with the rostral and with the frontal; latter as long as frontoparietals and interparietal together, in contact with the first and second supraoculars; four supraoculars, first and fourth longest; eight supraciliaries; frontoparietals and interparietal distinct, subequal; parietals forming a suture behind the interparietal; three pairs of nuchals; fifth upper labial entering the orbit. Ear-opening roundish, smaller than the eye-opening, without distinct lobules. 30 smooth scales round the body, the two vertebral series largest, at least twice as broad as long. A pair of large præanals. The hind limb reaches the elbow of the adpressed fore limb. Digits slender, feebly compressed; subdigital lamellæ smooth, 23 under the fourth toe. Tail once and two fifths as long as head and body. Pale greenish brown above, with deep black blotches, the largest forming two series along the back; lower parts greenish white; digits dark brown beneath, palm and sole bright yellow.

	millim.
Total length	138
Head	13
Width of head	8
Body	45
Fore limb	20
Hind limb	27
Tail	80

A single specimen.

Lygosoma curtum.

Section *Liolepisma*. Body short and stout; limbs rather feeble, with four fingers and five toes; the distance between the end of the snout and the fore limb contained once and two fifths to once and a half in the distance between axilla and groin. Snout very short, obtuse. Lower eyelid with a moderately large transparent disk, which is but little larger than the ear-opening. No supranasal; frontonasal nearly twice as broad as long, forming a broad suture with the rostral and a narrow one with the frontal; latter as long as or a little shorter than the single frontoparietal, in contact with the first and second supraoculars; eight supraciliaries; interparietal distinct; parietals forming a median suture; a pair of nuchals and a pair of temporals border the parietals: three upper labials anterior to the subocular. Ear-opening rather small, roundish, with a single projecting lobule on its anterior border. 26 scales round the body, all smooth, or dorsals with three feeble grooves. Præanals not enlarged. The hind limb reaches the wrist of the adpressed fore limb. Digits short; subdigital lamellæ smooth, 23 to 25 under the fourth toe. Tail little longer than head and body. Dark brown above, uniform or with small lighter spots; yellowish or greenish white beneath.

	millim.
Total length	82
Head	9
Width of head	6
Body	28
Fore limb	10
Hind limb	14
Tail	45

Four specimens.

Lygosoma iridescons. (Pl. I. fig. 4.)

Section *Emoa*. Habit lacertiform; the distance between the end of the snout and the fore limb contained once and one fourth

in the distance between axilla and groin. Snout moderate, pointed. Lower eyelid with an undivided transparent disk. Nostril pierced between three small shields—a nasal, a post-nasal, and a supranasal; frontonasal broader than long, narrowly in contact with the rostral and with the frontal; latter shorter than the single frontoparietal, in contact with the first and second supraoculars; four supraoculars; eight supraciliaries; interparietal fused with the frontoparietal, behind which the parietals form a suture; a pair of nuchals and a pair of temporals border the parietals; five labials anterior to the large subocular. Ear-opening oval, about as large as the transparent palpebral disk, with one or two very short obtuse lobules anteriorly. 26 smooth scales round the body, dorsals largest. No enlarged præanals. The hind limb reaches the axilla. Digits moderately elongate, flattened, except at the end, which is subcylindrical; subdigital lamellæ very fine, smooth, 65 under the fourth toe. Greenish bronzy above, strongly iridescent, with small black spots; sides darker brown, with black and yellow dots; dorsal scales with dark brown striæ; lower parts pale metallic green, palm and sole bright yellow.

	millim.
From snout to vent.....	50
Head.....	11
Width of head.....	7
Fore limb.....	18
Hind limb.....	22

A single specimen.

Sphenophryne Anthonyi. (Pl. II. fig. 1.)

Tongue large, oval, entire. Snout short, rounded, with distinct canthus and concave loreal region; interorbital space as broad as the upper eyelid; tympanum distinct, hardly half the diameter of the eye. Tips of fingers dilated into very large disks, which are subtriangular and broader than long; first finger shorter than second; toes with a rudiment of web, the disks much smaller than those of the fingers; no subarticular or metatarsal tubercles. The tibio-tarsal articulation reaches the shoulder or the tympanum. Skin smooth, areolate on the throat and belly; a fine raised vertebral line sometimes present, as well as a pair of lines converging backwards on the back, just behind the head. Coloration very variable. Grey, brown, or reddish above, speckled or spotted with black, or with large light blotches; a fine light vertebral line sometimes present; thighs and lower parts brown,

uniform or spotted with yellow, or yellowish marbled and reticulate with dark brown. Male without vocal sacs, with a light line along the chin and throat.

From snout to vent 45 millim.

Several specimens.

LIOPHRYNE, g. n. Engystomatidarum.

Pupil horizontal. Tongue large, oblong, extensively free and nicked behind. Two oblique series of vomerine teeth behind the level of the choanæ. Two dermal transverse ridges in front of the oesophagus, the second strongly denticulate. Tympanum distinct. Fingers and toes free, the tips slightly swollen. Outer metatarsals bound together. Præcoracoid present, ossified, very slender; no omosternum, sternum cartilaginous, small. Diapophyses of sacral vertebræ moderately dilated.

Liophryne rhododactyla. (Pl. II. fig. 2.)

Head much broader than long; snout shorter than the orbit, rounded, with obtuse canthus and concave loreal region; nostril a little nearer the tip of the snout than the eye; interorbital space a little broader than the upper eyelid; tympanum two thirds or three fourths the diameter of the eye. Fingers and toes rather elongate, depressed; first finger shorter than second; subarticular tubercles feebly prominent; a very indistinct inner metatarsal tubercle. The tibio-tarsal articulation reaches the eye. Skin smooth. Dark purplish brown, finely powdered with crimson above, spotted with yellowish beneath; a very indistinct fine light vertebral line; a crimson spot above the vent; fingers and toes crimson above.

From snout to vent 60 millim.

Three specimens.

Liophryne brevipes.

Closely allied to the preceding, but differing in the much shorter limbs with shorter digits, the tibio-tarsal articulation reaching only the shoulder. A pair of curved dermal folds from the posterior border of the head to between the shoulders. Grey-brown above, pinkish on the sides of the back; sides of head dark brown; belly greyish, marbled with brown, with a fine light median line; throat vinaceous red.

From snout to vent 22 millim.*

A single specimen.

MANTOPHYRNE, g. n. *Engystomatidarum*.

Pupil horizontal. Tongue large, oval, entire, grooved along the middle, free only at the sides and slightly behind. Palate toothless. Two dermal transverse ridges in front of the oesophagus, the second strongly denticulate. Tympanum distinct. Fingers and toes free, the tips feebly dilated. Outer metatarsals bound together. No præcoracoids; no omosternum; sternum cartilaginous, small. Diapophyses of sacral vertebra feebly dilated.

This genus is near to *Xenorhina*, Peters, but differs in the large eye and ranoid habit.

Mantophryne lateralis. (Pl. II. fig. 3.)

Head subtriangular, a little broader than long; snout obtusely pointed, shorter than the diameter of the orbit; canthus rostralis distinct; loreal region nearly vertical, concave; nostril nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum as large as the eye. Fingers and toes rather elongate, cylindrical, slender, with small terminal disks and strong subarticular tubercles; first finger shorter than second; a feeble oval inner metatarsal tubercle. The tibio-tarsal articulation reaches the eye. Skin smooth; a fine fold along the vertebral line, and sometimes several others along the back; chin with a pair of more or less distinct small warts. Grey or brown above, with small blackish spots and a broad black stripe on each side of the back from the eye to the groin; a dark blotch below the eye; a black stripe on the hinder side of the thighs; brownish beneath, dotted and spotted with blackish. Male without vocal sac.

From snout to vent 43 millim.

Several specimens.

Nyctimantis papua. (Pl. I. fig. 5.)

Tongue circular, nicked and slightly free behind. Vomerine teeth in two short transverse or slightly oblique series between the large choanæ. Head moderate, the skin free from the skull; snout rounded, shorter than the diameter of the orbit, with strong canthus and concave loreal region; interorbital space as broad as the upper eyelid; tympanum distinct, one third to two fifths the diameter of the eye. Fingers much depressed, webbed at the base, disks larger than the tympanum. Toes webbed to the disks of the third and fifth and to the penultimate phalanx of the fourth; a very small inner meta-

tarsal tubercle; subarticular tubercles moderate. The tibio-tarsal articulation reaches the tip of the snout or a little beyond. Skin smooth or with small warts above, granular beneath; a strong curved fold above the tympanum; heel sometimes with a small conical tubercle. Grey, olive, or reddish brown above, uniform or marbled with darker or with large insuliform spots; a light line may run along the canthus rostralis and supraciliary edge; dirty white or brown beneath. Male with an external subgular vocal sac.

From snout to vent 66 millim.

Several specimens.

EXPLANATION OF THE PLATES.

PLATE I.

Fig. 1. *Lygosoma nigrilineatum*.

Fig. 2. *Lygosoma Stanleyanum*.

Fig. 3. *Lygosoma elegans*.

Fig. 4. *Lygosoma iridescent*.

Fig. 5. *Nyctimantis papua*.

Fig. 5 a. Ditto. Open mouth.

PLATE II.

Fig. 1. *Sphenophryne Anthonyi*.

Fig. 2. *Liophryne rhododactyla*.

Fig. 2 a. Ditto. Palate.

Fig. 2 b. Ditto. Tongue.

Fig. 3. *Mantophryne lateralis*.

III.—Descriptions of Four new Species of Lycænidae from the Eastern Archipelago. By HAMILTON H. DRUCE, F.Z.S., F.E.S.

Thysonotis lampros, sp. n.

♂. Upperside allied to *T. philostratus*, Feld., which it resembles in colour, but the fore wing is entirely without the white discal band, and has a somewhat wider black outer margin, which is less distinctly defined on its inner edge. The hind wing differs from that of *T. philostratus* by the blue area being rather more extensive. The cilia of both wings (which in *T. philostratus* are black) are white, those of the hind wing slightly marked with black at the termination of the nervules. The underside differs from that species by the white band being usually narrower, and in the hind wing always straighter, not so curved in towards the base of the wing where it reaches the abdominal margin. The

bluish-green costal streak of the fore wing reaches closer to the apex before it rounds off along the outer margin, consequently the apex is less broadly black than in *T. philostratus*. The blue submarginal band on the hind wing is wider and its central black spots are more elongate. Cilia of both wings as above. Thorax and abdomen concolorous with wings.

♀. Upperside almost entirely blackish brown, with but a faint indication of a narrow pale band, which ends in a small creamy white patch on the abdominal margin, close to the base, after it crosses the submedian nervure. Cilia as in male. On the underside it differs from the male by the white band being narrower, and consequently the black areas being more extensive, and by the submarginal blue band of the hind wing being wider and containing still more elongate deep black spots. Some specimens have on the fore wing, between the blue band and the outer margin, a narrow whitish band from near the apex to the outer angle interrupted by the brown nervules.

Expanse, ♂ $1\frac{3}{4}$ – $2\frac{1}{2}$ inches; ♀ $1\frac{7}{10}$ to $2\frac{1}{2}$ inches.

Hab. Kiriwini, Trobriand Is., March to May (*A. S. Meek*).

Types Mus. Druce.

At first I thought that this species might be nearest to *T. regina*, Kirby, from Normanby I., but on examining the type of that species I find that it is allied in coloration to *T. apollonius*, Feld., which is entirely different from *T. philostratus*.

T. lamproa is the only species of this group which has entirely lost the white band on the fore wing above, and the female is much duller than any other described. Mr. Meek obtained many specimens, which scarcely vary except in size.

PHILIRIS, Röber.

Herr Röber has made Felder's *Theola ilias* from Amboyna the type of his genus.

It may perhaps be found convenient to retain Hübner's name *Candalides* (the first name mentioned under this heading being *xanthospilos*, Hübn. from Australia) for some species of this group, as I find that the 3rd subcostal nervule varies considerably in length.

Of the species described here, *P. thelos* has this nervule comparatively long as in *P. ilias*, whilst *P. speirion* and *P. mneia* have it comparatively short as in *P. philotus*.

Holochila abimilis, Feld., and its allies have it comparatively long, but the name *Holochila* cannot be used, as it is preoccupied.

Philiris theleos, sp. n.

♂. Upperside closely allied to *P. ilias*, Feld. Blue colour rather darker and more glistening; apex and outer margin of fore wing distinctly broader, black-bordered. Outer margin of hind wing, which in *P. ilias* is almost linear, distinctly and evenly black-bordered as in fore wing. Cilia whitish, with black at the ends of the nervules, but less conspicuous than in *P. ilias*. Underside differs from *P. ilias* by being a pale brownish white in place of pure white. Antennæ black with white spots. Abdomen black above, pale below.

Expanse $1\frac{3}{10}$ inch.

Hab. Amboyna, February (Doherty).

Type Mus. Druce.

This species has the outer margin of the fore wing nearly straight as in *P. ilias*.

Philiris speirion, sp. n.

♂. Allied to *P. philotus*, Feld.: upperside a much brighter and bluer shade of purple, with the black borders to both wings rather more than twice as broad, and the white cilia more conspicuous and less distinctly spotted with black at the terminations of the nervules. Underside as in *P. philotus*.

♀. Upperside: both wings pale shining cærulean blue, much the colour of *P. philotus*, ♀, but more brilliant, with broad blackish-brown margins. Cilia grey. Underside as male, but paler.

Expanse, ♂ ♀ $1\frac{1}{2}$ inch.

Hab. Fergusson I., September to December (A. S. Meek).

Types Mus. Druce.

Mr. Meek obtained many specimens which do not appear to vary.

It seems to be a very distinct form, and the female is, I believe, the first one of this genus described which has the conspicuous blue area of almost equal extent in both wings.

This insect, together with the next described, has the outer margin of the fore wing in the male distinctly convex, as in *P. philotus*. There appears to be a patch of darkened scales in the cell of the fore wing in *P. philotus*, but I can find no trace of this in *P. speirion*.

Philiris mneia, sp. n.

♂. Upperside uniform dark purplish brown; cilia greyish. Underside differs only from *P. philotus* by being of a more reddish-brown shade and by the unmarked cilia.

♀. Upperside dull deep brownish black; cilia of fore wing brownish, of hind wing white, with black spots at the termi-

nations of the nervules. Underside paler than male, with the cilia of the fore wing black, of hind wing white, with large black spots at the termination of the nervules, and with an anteciliary black line.

Expanse, ♂ $1\frac{1}{2}$ inch; ♂ $1\frac{1}{2}$ – $1\frac{3}{4}$ inch.

Hab. Batchian, March (*W. Doherty*).

Some female specimens have a few blue scales dusted on the disc of the fore wing above.

This species has long been in collections, but I have nowhere seen it described.

IV.—Contributions from the New Mexico Biological Station.

—No. 2. *On a Collection of Diptera from the Lowlands of the Rio Nautla, in the State of Vera Cruz.* I. By C. H. TYLER TOWNSEND, F.E.S.

THE following Diptera were all collected by the writer, in March, April, June, and July, at San Rafael and Paso de Telaya, on the Rio Nautla, about a mile below and above Jicaltepec, but on the opposite or north side of the river. Paso de Telaya is but two miles from San Rafael, and really forms a part of that settlement. This locality is about four or five miles inland from the coast, and about 30 or 40 feet above sea-level.

Many of the Diptera in this collection were taken, from June 26 to July 19, at San Rafael, on flowers of two closely approximated patches of a shrub known by the native name of *barra negra*. It has been determined by Dr. J. N. Rose as *Cordia* sp., probably *C. ferruginea*. Although the flowers of this shrub are small, whitish, and inconspicuous, they were visited by many flies, bees, and other insects. They were about the only flowers in the vicinity from the last of June through July.

A word may be said about the seasons which prevailed during the period of my collecting. There were occasional northers, accompanied by rain, through March and April. No rain fell through May, and not until about June 14, it thus having become very dry, when there came a good rain which lasted two days. After this no more rain fell till July 12, when it rained hard, and continued to rain, some in nearly every twenty-four hours, up to July 20, when I left.

The Lower Rio Nautla region possesses many temperate forms of insects, and therefore comes well within the limits of the *Tamaulipan* fauna. Probably its temperate forms fall short of 25 per cent. of the whole fauna. It is of course,

from its great preponderance of tropical forms, to be classed with the *Neotropical* region proper. The student is referred, for further information on the *Tamaulipan* fauna and the biogeography of the Mexican region, to a paper published by the writer in the 'Transactions of the Texas Academy of Science,' vol. i. pp. 71-96.

The fauna bears some resemblance to that of the Lower Rio Grande region; but the Diptera do not show the resemblance so much as do the Coleoptera and Hemiptera. A considerable number of familiar forms among the more striking species of the two orders last named were collected, which I recognized as having previously taken in the palmetto hammocks near Brownsville, Texas. But these largely represent the tropical or subtropical element of these faunas in the Lower Rio Grande region.

On the whole the Lower Rio Nautla fauna is decidedly tropical in its aspects, especially as regards the Diptera.

The *Cordia* above mentioned was noticed growing, and in flower, July 20 and 21, in places on the road that leads from San Rafael (or Jicaltepec) to Perote, as far up as a point about halfway, or more, between Tlapacoyan and Jalacingo. It was particularly noticed above Tlapacoyan, and up to an altitude, I should say, of 4000 feet or over. In the lowlands it did not seem to me to be so abundant as above Tlapacoyan, but rather of occasional occurrence. It is well to note that it was an extremely good fly-plant.

It may be added that vanilla, coffee, rubber, &c. do well on the Lower Rio Nautla. It is an especially good vanilla country from there north to the Papantla district.

Chironomidae.

1. *Ceacta furens*, Poey.

Numerous specimens, Nautla, March 5.

This species ranges up and down the Mexican Gulf coast from Tamaulipas to the Isthmus of Tehuantepec, and extends some short distance inland. I have already recorded it from both the north and the south coasts of Jamaica (Journ. Inst. Jamaica, i. p. 381), which was the first record of its occurrence outside of Cuba, where it was originally discovered and described by Poey. I have observed it on car windows in the State of Tamaulipas, near Victoria, in October, it having perhaps been brought thus from Tampico; and I have also noticed it at the mouth of the Coatzacoalcas river.

Dry pinned specimens show the wings to be strongly iridescent in certain lights, the dark and the white spots alike,

as well as the veins and whole wing-surface, especially noticeable being various rich shades of blue and violet. Poey remarks at some length on this peculiarity (Mem. Hist. Nat. Cuba, i. p. 240: Havana, 1851). When the wing is held up to the light and looked through, the dark spots appear faint, excepting only the elongate rectangular black stigma; this can be seen with the naked eye.

Stratiomyidæ.

2. *Sargus*, sp.

One specimen, June 19, San Rafael. Taken from an attid spider which had captured it.

Length 10 millim.

Eyes not contiguous. Front deep metallic green on posterior two-thirds, pale yellowish on anterior third. Thorax and scutellum deep metallic green, with purplish reflection on dorsum. Abdomen black, with hind borders of segments broadly shining violet or purplish. The black of abdomen is soft opaque in some lights, and shining in others. Wings scarcely tinged with fuscous. Legs pale yellowish, middle femora broadly brownish in middle, hind femora blackish except bases and tips, hind tibiæ black on distal half, and hind tarsi blackish except basal half of metatarsi.

Tabanidæ.

3. *Chrysops costatus*, Fabr.

One female, March 16, San Rafael.

Length $7\frac{1}{2}$ millim., not including antennæ.

The eyes in life are green, with brown-black markings. There are four brown-black, rather quadrangular spots on anterior portion of eye, arranged in the shape of a diamond, with the long axis vertical. The posterior spot of the four is longitudinally elongate, occupies very nearly the centre of the eye, and is bisected by a vertical brown-black linear stripe extending from the upper to the lower margin of the eye. The anterior spot is nearly square, while the other two (upper and lower spots) are transversely elongate. In addition to these four spots, there is a vertical bronzed line near posterior edge of eye and parallel with the hind margin, extending from upper to lower border.

Annulate portion of third antennal joint black, the distal part of basal non-annulate portion tinged with blackish. The non-annulate portion of third joint is rather distinctly

constricted, so as to appear like three rings or joints, besides the bulbous base. Frontal callosity not brown on posterior edge, wholly rust-yellow. Outer branch of the two blackish abdominal markings quite obsolete, inner branch reaching anterior margin of fourth segment. Front, face, palpi, and basal joints of antennæ all the same colour, which is a rust-yellow. No lateral brown vittæ on venter. The broad middle band of wings is not straight on distal border but convex; the proximal border is concave, but the small and adjoining cross-veins are well within this border. It agrees with the two Jamaican specimens mentioned by me (Trans. Am. Ent. Soc. xxii. p. 56) in having the hyaline portions of the wings the same as there described. Legs all rust-yellow, tips of tarsi brownish.

4. *Hadrus lepidotus*, Wied.

One female, March 5, on the Estero (a deep inlet from the sea) between San Rafael and Nautla.

Length 8 millim. Others seen but not taken, being difficult to catch.

The eyes in life are red, with green outer border, and two outwardly abbreviated transverse green stripes. The green stripes are bordered and prolonged by a darker red than the ground-colour of the eye.

Agrees perfectly with Wiedemann's description, but the clear apical portion of the wing comprises less than one third of the wing's length, and the whitish border is arcuate, the black being convex on distal border. Anal and fourth and fifth (last two) posterior cells, also axillary portion of wing and alula, hyaline—except that there is a subdetached piece of brown, left by two of the white drop-like spots, in the base of the fourth and fifth posterior cells, and the brown extends into the outer edge of the fourth posterior cell on its apical half, ending on the inner margin of wing in a pointed extension, which occupies about the basal half of second and third posterior cells. On base of wing the black stops short of inner margin of second basal cell. The white drop-like spots are arranged as follows: one on junction of veins at base of second posterior cell, one on small cross-vein, one in extreme base of first basal cell, one each in first and second basal cells before apex and opposite to each other, and two on cross-veins at base of fourth and fifth posterior cells. Scutellum with a coppery-purplish tinge. Middle and hind tarsi white except blackish tips, front tarsi whitish on little more than basal joint (metatarsus).

*Syrphidæ.*5. *Nausigaster meridionalis*, sp. n.

One female, July 16, San Rafael. On flowers of the *Cordia* sp.

This specimen seems to agree with those mentioned by Williston from the Isthmus of Tehuantepec (Syn. p. 22) and Chapada in Brazil (Trans. Am. Ent. Soc. xv. p. 259), rather than with *N. punctulata*, Will. Dr. Williston remarks, in the Biol. Centr.-Amer., Dipt. (vol. iii. p. 6), that he believes these specimens to be distinct from the more northern *N. punctulata*, an opinion in which I concur. The species, as represented by my specimen, differs as follows from Williston's description of *N. punctulata*:—

♀. Length 8 millim.

There are four indistinct stripes to be seen on mesoscutum, more shining and greenish than the rest of surface, but they are very hard to distinguish. Cheeks and lower part of face rather reddish brown, the antennæ being of a lighter shade of same colour. The marking of the wings, which is the principal distinguishing character, is as follows:—The black is all coalesced into one marking, and is more extensive than in any of the specimens mentioned by Williston. Beginning in the third costal cell, at end of auxiliary vein, it widens in passing through the marginal cell, fills out all of the submarginal cell except the apex, and terminates distally by broadly filling the apex of marginal cell. Proximally it continues broadly inward across small cross-vein, following the spurious vein to its end, into base of discal cell, less broadly in base of the last posterior cell, and thence filling out nearly all of second basal cell. It spreads narrowly into first posterior cell on its front border. There is also a narrow streak of black on anterior edge of first basal cell in middle, being in front of spurious vein. Legs reddish brown, with black on base of front femora and on other femora except tips.

6. *Baccha phæoptera*, Sch.

One female, March 30, Paso de Telaya.

Length 13 millim.

It possesses the median linear vitta of mesoscutum in the black between the two pairs of vittæ mentioned by Schiner. The lateral borders of mesoscutum are broadly yellow. A transversely elongate brown spot on sides of thorax below and posterior to humeri. Schiner seems to mistake the first two abdominal segments for one, speaking of them as the first,

calling the third the second, &c. The first segment is wide, short, lunate in shape, and yellow, with hind border broadly dark brown, the brown not extending the full width of segment. Neither arm of the horseshoe-like yellow lateral marking of third segment reaches hind margin, but the arms are equal. On fourth and fifth segments both arms reach hind margin. Sixth segment shows this marking as a small V on each side. Third, fourth, and fifth segments show the median linear vitta throughout, but this is only very faintly apparent on the elongate and narrowed second segment. The yellow marking called by Schiner "horseshoe-shaped" is very narrow to be so characterized, and on third segment is rather inverted V-shaped. On third and fourth segments it is open behind, but on fifth its arms join on hind margin of segment on one side in this specimen, while on the other side they are open. The facial tubercle is of good size and prominent. Black ocellar spot not shining, opaque. Hind femora pale reddish on more than basal half, with only faint ring of brown before tips. Wings tinged with fuscous yellowish; appearing deep yellow when held up to the light. In Schiner's specimens the wings were doubtless darker. I give these detailed comments on Schiner's description, so as to assist in the determination of the species in the future.

7. *Ocyptamus fuscipennis*, Say.

Three female specimens, March 2 and 23, San Rafael; and April 7, Paso de Telaya.

Length about 8 millim.

The white of face does not extend on sides of front. Face hardly yellowish in one specimen. All the tarsi reddish yellow in two specimens, and only hind tarsi faintly tinged with brownish in the other. Black of wings not at all diluted in anal, last posterior, and discal cells in one specimen, and but very slightly in the other two.

8. *Volucella obesa*, Fabr.

One male, July 18, San Rafael. On flowers of the *Cordia* sp.

9. *Eristalis ornatus*, sp. n.

Two males, July 10, San Rafael. On flowers of the *Cordia* sp.

♂. Length $10\frac{1}{2}$ to 11 millim.

Near to *E. ochraceus*, from Williston's description of which (Trans. Am. Ent. Soc. xv. p. 279) it differs as follows:—There

is more or less black pile mixed with the yellow on frontal triangle. First abdominal segment silvery whitish in middle. Linear brown stripe of second and third segments almost obsolete. There is hardly any dark anterior margin perceptible on second segment. The third and fourth segments are the same colour as the second, but they each have an entire shining cross-band which the second lacks. Fifth segment black. Legs rather deep reddish yellow, with proximal half of middle and front tibiae yellowish white. Hind femora narrowly and faintly brownish on distal ends above. Tarsi wholly reddish yellow, distal half of foot-claws black. Wings pure hyaline, except a small well-defined subquadrate dark brown or blackish spot at end of auxiliary vein, between latter and first vein. Wing-veins pale yellowish. Tegulae light buff-yellow, with a fine long yellow silken fringe on border; alulets faintly fuscous, with a ciliate black fringe.

10. *Meromacrus crucigerus*, Wied.

Seven males and five females, San Rafael. A small female, March 16; the others July 1 to 18, on flowers of the *Cordia* sp.

Length $11\frac{1}{2}$ to 15 millim.

The ground-colour of the small female taken in March is black, except two reddish oval lateral spots on second segment anteriorly. In this specimen also the facial stripe and frontal vitta are more or less blackish. All the others belong to the form mentioned by Williston in the Biol. Centr.-Amer., Dipt., from Sonora and Teapa. The ground-colour of abdomen is reddish brown, hind femora blackish or brown except at distal end. Two of the females (July 9 and 18) have the posterior segments of abdomen a little darker, and all of the four females taken in July have the frontal vitta blackish only on posterior two-thirds. They all, however, as well as the males, have the facial stripe reddish. Frontal triangle in the males, and anterior one third of frontal vitta in the females, reddish. In all the males except one the pile on sides of frontal triangle is whitish instead of yellow. Pile of sides of front and face in female very deep yellow, like the pile of thoracic and abdominal markings. These latter markings agree perfectly with Williston's description (Syn. p. 180). Middle of first abdominal segment, and narrow concave front border of second, opaque black. A more or less distinct blackish tinge to other segments, leaving a pair of large reddish lateral lunate triangles on second segment.

Conopidæ.

STYLOGASTER.

Fifty-one specimens of this interesting genus were taken hovering over the front ranks of a moving army of ants, in a *cafetal* at Paso de Telaya, during the last hour or two of daylight on March 29. In company with them were numerous specimens of *Hyalomyia* and some other small tachinids. The ants have been determined by Mr. Theo. Pergande as *Eciton Foreli*, Mayr. Mr. Pergande adds that they are the most northerly form of that species, which is a widely distributed one in the American tropics. The column of ants was about 15 feet wide and 25 feet long, and moved slowly but surely in a straight line through the *cafetal*, swarming rapidly over the thick covering of dead leaves, branches, and other obstructions that strewed the ground under the coffee-trees. The specimens of *Stylogaster* hovered continually over the ants, now and again darting at them, without doubt for the purpose of ovipositing in their bodies. During the whole three months of my collecting in this locality, I saw not a single specimen of *Stylogaster* at any other time; but on this occasion, during the short time that I had before dark overtook me, I succeeded in capturing fifty-one specimens, by sweeping closely with the net over the front ranks of the ants. These fifty-one specimens belong, strange to say, to three new species, all distinct from *biannulata*, Say, and *neglecta*, Will., the only species hitherto known from America. The genus has never before been recorded from Mexico or Central America. No specimens were contained in the Biol. Centr.-Amer. collections, as evidenced by the genus not being mentioned by Dr. Williston in his treatment of the Conopidæ.

Williston has stated (Trans. Conn. Acad. 1885, p. 389) that this genus, "it is thought, may be parasitic upon termites." However this may be, I believe that my observations, as above detailed, leave no doubt that the three species described below are parasitic upon ants of the genus *Eciton*, in the State of Vera Cruz.

Such a series of specimens as the present could not fail to throw some light on the confusion existing with regard to the described species, and especially to the specimens described by Wiedemann, although I think that Dr. Williston has presented the latter question in its true light in his most recent paper on *Stylogaster* (Kans. Univ. Quart. i. pp. 120-122). I believe there is no doubt that Wiedemann had two, and perhaps three species before him, one of these

being *neglecta*, Will. It is equally certain that Fabricius's name *stylata* must be dropped for the present, from the utter uncertainty as to what his species was, since the relative length of the antennal joints is not mentioned in his description, and the antennæ are apparently absent in the type, while it is known that the abdomen is wanting. Thus it would be futile for me to attempt to define it in the synoptic table of species given below. It is barely possible that an examination of the type, though so badly mutilated, might place it, providing it could be found. Judging from Fabricius's description, I believe it possible that his species *stylata* may be distinct from any described, including those in this paper.

In the light of my material, I am inclined to think that the male specimen described by Dr. Williston as *biannulata*, Say (Trans. Conn. Acad. 1883, p. 7), is distinct from that species, as the descriptions differ on the colouring of the front in a way that can hardly be mistaken, especially since the fifty-one specimens of my three species show absolutely no variation in this regard.

*Synoptic table of the American species of Stylogaster
so far known.*

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| 1. Second antennal joint short, about as long as broad,
third joint strongly elongate | <i>neglecta</i> , Will. |
| Second joint elongate, nearly or quite as long as
the third | 2. |
| 2. Mesoscutum with the lateral borders broadly pale
yellow, rarely indistinctly so; front rufous
yellow anteriorly | 3. |
| Mesoscutum with only the humeri pale yellow, front
wholly without yellow anteriorly | 4. |
| 3. Abdomen with a distinct median vitta (rarely sub-
obsolete), widened into a triangle on base of
second segment | <i>stylosa</i> , sp. n. |
| Abdomen without such vitta | <i>biannulata</i> , Say. |
| 4. Large species with prevailing colour blackish, hind
tibiae and ovipositor conspicuously silvery white
before tips, silvery of face extending on sides of
anterior half of front | <i>ethiopa</i> , sp. n. |
| Small species without white on hind tibiae or ovi-
positor, and with front wholly blackish or brown
to antennal pit | <i>minuta</i> , sp. n. |

11. *Stylogaster stylosa*, sp. n.

Eight female, and six male specimens.

♂ ♀. Length of female nearly 5 to over 6 millim., not including ovipositor, which is $2\frac{1}{2}$ to 3 millim. Length of male $6\frac{1}{2}$ to 8 millim.

Very similar to *S. biannulata*, Say, as shown by Say's

description, but differing in the very constant character of the median abdominal vitta. Face wholly silvery; the anterior half (or more than one third) of the front rufous yellow, with the silvery of face extending narrowly on sides of this yellow portion and ending in a point on each side. Rest of front soft opaque black, except the shining black ocellar area. First antennal joint light yellow, as is base of second; rest of antennæ rufous, the third joint being more or less tinged with fuscous on upper edge and tip; arista blackish. Second antennal joint in all the specimens fully as long as third, or even sometimes appearing very slightly longer; base of third joint about same width as apex of second. Proboscis of ordinary length for the genus, each of the two joints about 3 millim. long, broadly whitish on tip, yellowish at base, with more or less of a silvery-white reflection. Mesoscutum blackish, with humeri and broad lateral borders yellow (in one specimen darker at base of wings), the yellow also continuing around hind margin and extending anteriorly in a median pair of short vittæ nearly to transverse suture, each vitta terminating in a point, which is connected by a usually distinct line with the yellow of the humeri. The suture is also marked, especially on lateral sections, with a faint yellow line. In fact the thorax might be described as yellow, with three heavy closely approximated black vittæ on dorsum; the middle vitta widest, beginning on extreme front border of thorax and ending in a point (sometimes faint) at scutellum; the lateral vittæ strongly abbreviated in front, their outer borders convex, and ending rather pointedly behind at scutellum. Sides of thorax silvery pollinose, with a faint or nearly obsolete touch of brownish below and a little before wing-bases, the brownish with shining surface. Scutellum pale yellowish, brownish on disk. Abdomen yellowish; first segment more or less brownish on dorsum, sometimes as a posterior margin, sometimes as a geminate marking indented on middle in front; second to fifth segments brown or blackish on posterior margin, the fourth and fifth sometimes with a dark tinge on anterior portion, and always more or less distinctly silvery-white pollinose on all except the brown hind border; a distinct (in one female only is this indistinct) median brown vitta on second to fifth segments, dilated into a triangle on second segment, the base of the triangle being coincident with front border of segment. Abdomen thinly clothed with short black hairs. Ovipositor of female hardly as long as abdomen, composed of two segments: first segment usually longer than second including the appendages of latter, with more or less brown or blackish on dorsum; second segment

more uniformly brown or blackish, darkest on dorsum, sometimes yellowish on underside. Appendages of ovipositor are as follows:—The underside of second segment at its tip is extended into a long, narrow, sheath-like point, considerably shorter than segment itself; an elongate, spatulate, but sub-equilateral, palpus-like organ, clothed with black hairs, proceeds from tip of second segment and lies along upper surface of this sheath, being about equal in length with the latter; at base of spatulate organ, and apparently springing from second segment, are two short palpi-form organs also clothed with black hairs. These appendages are all more or less yellowish or rufous. In some specimens the sheath seems to be split obliquely lengthwise on each side, forming three pieces, and the side pieces, which are rather slender, are sometimes hard to distinguish on account of their lying closely against sides of spatulate organ; in such cases the sheath-like point of ovipositor seems very short, not nearly the length of the spatulate organ. Front and middle legs light yellow, the tarsi more or less blackish except metatarsi; hind legs as described for *biannulata*, the hind femora (as in all species known to me) biannulate with blackish; hind tibiae with a narrow, rarely faintly silvery ring on middle, distal two fifths of hind tibiae and all of hind tarsi black. Wings evenly infuscated, halteres fuscous except the yellowish stalks. Abdomen of male widened and blunt at end, with six visible segments, the sixth blackish on sides; a tuft of yellow hair on underside of abdomen at tip. Hind femora of male with the brush-like black hairs on underside at base; hind tibiae only slightly bent, sometimes hardly perceptibly so. Hind tibiae swollen on distal half in both sexes, more so in the male.

Wiedemann seems to have had this species before him when he wrote his description of *S. stylata*, Fabr., for he describes exactly the median longitudinal vitta of abdomen with its triangular expansion on second segment, stating that some specimens possessed this.

12. *Stylogaster ethiopa*, sp. n.

Twenty female specimens, none of the other sex whatever.

♀. Length 7 to 8 millim., without ovipositor; latter 4 to 4½ millim.

Face yellowish, silvery pollinose; silvery extending on sides of front and ending in a point on each side before reaching occipital margin; rest of front opaque blackish, except the large, triangular, shining, black, ocellar area. Antennae blackish, reddish on underside of third joint.

Proboscis quite strongly elongate, very distinctly more than in *S. stylosa*, each of the two sections being 5 millim. long in the largest specimens, making whole length 10 millim., not including the base; each section 4 millim. in small specimens. Proboscis white at tip, yellowish at base. Thorax black above, except the pale whitish humeri; on sides whitish, with a broad fascia of black extending from dorsum, between humeri and base of wings, down to base of middle coxæ. Scutellum black, faintly pale yellowish on lower edge. Abdomen black, a half-round whitish-yellow spot on each side at base of segments two to five. These spots are clothed more or less with whitish pile, especially on their anterior portions, and are largest on the third and fourth segments, but occupy less than half the length of the segment. Ovipositor elongate, somewhat longer than abdomen, composed of two segments; basal segment about one third longer than terminal, black, with base yellow; second segment black, yellowish at base and clothed with white hair on its basal half, thus giving the ovipositor its conspicuous silvery-white ring before tip. Appendages of second segment of ovipositor same as in *S. stylosa*, except that the under sheath-like extension is short and rather more blunt at tip, being only one half or one third the length of spatulate organ, and the parts are blacker. The spatulate organ and the two palpi-form organs at its base are rather thickly clothed with longer black hairs, the former from a side view looking like a feathery or short-plumose arista. Front and middle legs pale yellow, finely short black-hairy, the coxæ whitish and mostly bare, the bases of femora blackish, those of middle femora more broadly so; tibiæ whitish and white-hairy except on outer side of proximal two fifths; the tarsi tinged with brownish and thickly clothed with short black hairs; hind legs black, the coxæ shining black and appearing seed-like on posterior surface, the femora broadly pale yellowish at each end and with a whitish or pale yellowish ring in middle; the tibiæ with a broad white ring clothed with white hair just before tips. Wings evenly infuscated; halteres fuscous except the rufous-yellow stalks and bases.

13. *Stylogaster minuta*, sp. n.

Seven female specimens and ten males.

♂ ♀. Length of female 4 millim., not including ovipositor; length of latter 2 millim. Length of male 5 to 5½ millim.

This species, save for its small size, looks at first sight very much like *S. stylosa*, but differs from it in the following characters, which are very constant:—Front wholly brown

or blackish to base of antennæ, the front border of the brown being perfectly concave-semicircular, as limited by the posterior edges of the pit or hollow in which antennæ are inserted. Each of the two joints of proboscis 2 millim. long; base of proboscis a little more broadly yellowish and with silvery-white reflection. Mesoscutum shining blackish, without lighter lateral border, only humeri whitish, the black of dorsum extending in a dilute fascia halfway to middle coxæ, the rest of sides of thorax being whitish. Scutellum blackish. Abdomen without median vitta, but blackish or brown, with second and third segments more or less broadly whitish yellow on bases, usually leaving on third segment a median brown triangle and on second segment a triangle with a median geminate or entire spot-like dilatation at anterior angle. Fourth segment more or less yellowish laterally on base, often in female almost wholly black, quite constantly in male rather broadly yellowish; the fifth segment with less yellowish on base than fourth. Ovipositor of female blackish, yellowish at base; appendages yellowish and with the two palpus-like organs more elongate. Hind femora biannulate with blackish. The pale yellowish of hind legs more or less tinged with brownish, and especially on the tarsi and distal half of tibiæ, which appear dusky. Tip of male abdomen usually blackish, with the yellowish hair inconspicuous. The brushes of long black hairs on underside of bases of hind femora in male are comparatively better developed than in *S. stylosa*, and the hind tibiæ are more distinctly bent.

Tachinidæ, sens. lat.

14. *Acaulona costata*, v. d. Wulp.

Acaulona costata, v. d. Wulp, Biol. Centr.-Am., Dipt. ii. p. 4.

Two specimens, male and female: the male, April 8, Paso de Telaya; the female, July 12, San Rafael, on flowers of the *Cordia* sp.

Length of female 5 millim., of male fully 6 millim.

After examining the genitalia of both of my specimens, I believe that v. d. Wulp's specimens are the female. The front is the same width in both sexes. The male has the claws and pulvilli elongate, about twice as long as in female. The male has the elongate-oblong, somewhat flattened abdomen characteristic of the males of *Trichopoda*. It is not widened in middle, but is of equal width except for the gentle narrowing of last two segments and rounding off of anal segment. It is but slightly narrowed at base. The female abdomen is ovate, convex, more narrowed at base, and

widened on second segment. The foot-claws and pulvilli in my female are not particularly short, but are as long as last tarsal joint. The colouring of abdomen differs in male by having the brownish triangles of segments more narrowed behind, less spreading, and forming a more distinct median stripe, especially on first segment.

My specimens differ as follows from v. d. Wulp's description:—Antennæ somewhat more than half the length of face, third joint hardly twice as long as second. First abdominal segment of female longer than second or third, or even fourth, which latter is longer than either second or third, these two being about equal. Second, third, and fourth segments of male about equal, but little shorter than first, the fifth segment about two thirds length of fourth. (Above are from comparison with the generic characters.) Antennæ of male brownish, of female largely fulvous. Markings of thorax pale golden, alike in both sexes. Scutellum fulvous on border. Mesoscutum bordered broadly with golden behind the suture as well as before it. Dark markings of abdomen pale brownish. Fourth abdominal segment in female with the brown fainter than on the other segments. Fourth segment in male mostly brown. Genitalia hardly darker than the fulvous of anal segment. Front femora in female with but very little yellow at base, middle femora rather narrowly and hind femora more broadly yellow. In male front femora are narrowly yellow, but middle and hind femora have basal half to two thirds yellow. The differences in the foot-claws of the two sexes are exactly similar to those in *Trichopoda*. In the male the claws are elongate, wholly of a pale tawny or brownish yellow, and straight; in the female they are shortened, abruptly curved at end so as to be hook-shaped, and the hook-like tips are abruptly black.

I believe that the two appendages of anal segment, figured and described by van der Wulp, belong to the female genitalia.

15. *Trichopoda tegulata*, sp. n.

One female, July 1, San Rafael. On flowers of the *Cordia* sp.

♀. Length 8 millim.

This beautiful species is very easily distinguished from any so far described. It is entirely black except as follows:—Face silvery-white pollinose, extending upon sides of front as far as middle. Checks and occiput with a cinereous silvery bloom, extending over sides of thorax and coxæ. Transverse suture of thorax marked by a deep gold line, widened and spot-like at ends. Two golden vittæ of same width as that

on transverse suture, linear, extend from anterior margin of thorax to transverse suture, are parallel, and divide the black of mesoscutum in front of suture into three portions of exactly equal width. Wings entirely black, except the hind border, which is hyaline. Pulvilli pale yellowish white; foot-claws pale yellow, with black hooked tips (female). Halteres pale yellowish, more reddish at base. The character from which I have named the species, and which is so striking that it will distinguish it at once, is the colour of the tegulæ and alulets. The tegulæ (lower pair of scales) are large and wholly of a deep golden-yellow colour, being very conspicuous against the black of the body and wings, while the alulets (upper pair of scales, appearing like an upper and smaller pair of tegulæ), which cover the forward portion of the yellow tegulæ, are pure white on the anterior half and abruptly black on posterior half (the wing being understood to be directed backward in the usual position). Such a beautiful effect in coloration of the tegulæ and alulets I have never before seen in any fly.

Note.—What I have called the alulets (the upper or smaller pair of scales) are not true tegulæ, but appear so when the wing is flexed or directed backward in its usual position. When the wing is extended strongly forward it is seen that this smaller scale is a part of it, being borne on the extreme base of the inner edge of the wing, proximad of the alula, which in turn is proximad of the axilla (anal or axillary angle) of the wing. It should be known as the *alulet*, which is the diminutive of alula. I think that this term is deserving of use and should be adopted. Beginning, then, with the axillary angle of the wing, the latter being extended forward to its utinost, and proceeding inward or proximad, we have in order the *axilla*, *alula*, *alulet*, and *tegula*. I remark here upon these points of terminology in detail, as no writer seems ever to have paid any attention to the distinctions to be made in the application of the last three of these terms.

Since the above was written Dr. Williston has called attention, in his new synopsis of *Diptera* just published, to the fact that Osten Sacken has proposed the name "*antitegula*" for the upper pair of scales. I think "*alulet*" is a preferable term, from the fact that it is a short word and has long been in use, notwithstanding that it has been indefinitely applied in some cases.

While on the subject of *Trichopoda*, I wish to propose the name *T. subalipes* for the species described by me from Santo Domingo under the name of *T. subciliipes* (Journ. N. Y. Ent.

Soc. ii. pp. 78, 79). The latter name is preoccupied by Macquart for a species described by him from Guiana.

16. *Cistogaster immaculata*, Macq., sens. str.

Cistogaster immaculata, Mac., sens. str., nec Towns. Trans. Am. Ent. Soc. xxii. p. 67.

One male, March 18, San Rafael.

On pages 66-67 of the Trans. Am. Ent. Soc. xxii. (1895) I gave detailed notes of my own on two forms among the females of what had previously been known as *Cistogaster divisa*, Lw. I also presented some interesting notes sent me by Mr. Charles Robertson on the separation of the males and possible connexion of the two series of the latter with the two female forms. I am inclined now to adopt this view, and thus consider these two series as distinct species. The remarks that I made at end of page 67 on the names to be used for the two forms should be corrected. Since writing those remarks I have found that Macquart described the male of the "dimorphic" female, while Loew described the male of the "normal" female. Therefore the species possessing the "dimorphic" female will be known as *C. immaculata*, Mcq., and that possessing the "normal" female will be known as *C. divisa*, Lw. Walker's name *occidua* will remain a synonym of the latter.

The present male specimen belongs to *C. immaculata*, Mcq., being the male form in which the median longitudinal fuscous stripe of abdomen is wanting, which male should be connected with the "dimorphic" female. Macquart's description leaves no doubt on this point, as he says of the abdomen "une ligne dorsale de reflets d'un blanc jaunâtre." He describes the abdomen as ferruginous, the first segment with a small dorsal triangular black spot, and the third segment with yellowish-white pollinose reflections on each side. My specimen has the median pollinose line and the pollinose surface on each side of third segment golden instead of yellowish white. The fourth segment is tinged with darker and the golden pollinose covering extends over nearly the whole of it. The deep golden yellow of sides of front extends fully halfway down the sides of face. The whole mesoscutum and scutellum are deep golden pollinose, the former with median pair of linear darker vittæ in front of transverse suture and an outer heavier vitta on each side not reaching front margin and broadly interrupted by suture.

Length nearly 6 millim.

17. *Penthosia satanica*, Bigot.

Penthosia satanica, Bigot, van der Wulp, Tijdschr. v. Ent. xxxv. (1892) pp. 189-190.

One male, July 4, and two females, July 5 and 6. San Rafael, on flowers of the *Cordia* sp.

Length of male $10\frac{1}{2}$, of females $11\frac{1}{2}$ millim.

The frontal bristles extend well below the antennæ, but there is no row of hairs on each side of face except these. The first and second antennal joints are about equal, taken together they are about as long as width of front at vertex; the third joint is greatly elongated, being four or five times as long as the second, which is not by any means very short. In the male especially the third joint is widened distally and is subtruncate at tip. Arista nearly as long as third antennal joint. Thorax is not "densely pilose," but whole thorax, abdomen, and legs are well and quite thickly clothed with short hair. The only long macrochaetae are on the scutellum. Foot-claws of male long and nearly straight, of female shorter and hooked at tip. The only light colouring on this entire insect is the silvery-white pollinose stripe extending from middle of front on each side down to cheeks. It is interrupted below base of antennæ. Even this looks blackish in certain lights. Otherwise the entire insect is black, even to the pulvilli and wings, the latter, however, having a purplish lustre.

18. *Saundersia rufopilosa*, v. d. W.

Saundersia rufopilosa, v. d. W., Biol. Centr.-Am., Dipt. ii. p. 22.

Two male specimens of this beautiful species, San Rafael, March. Heretofore recorded only from Guatemala and Costa Rica.

Length 11-12 $\frac{1}{2}$ millim.

First two antennal joints rufous. Mesoscutum deep golden pollinose, rather than cinereous. I should certainly call the frontal bristles strong, not "rather weak." Pilosity of occiput deep golden yellow. Second and third antennal joints same length. Pilosity of mesoscutum short, black. The three black dorsal spots of abdomen, on median line of second, third, and fourth segments, not coalesced, entire. Bristles on coxæ and underside of femora either wholly yellow or wholly black. Alulets golden fulvous, the tegulae faintly tinged with fuscous.

19. *Belvosia bicincta*, R. D.

One female, July 16, San Rafael. On flowers of the *Cordia* sp.

Third antennal joint hardly twice as long as second. Facial ridges not ciliate, with some bristles not extending halfway up.

Length 15 millim.

20. *Belvosia bifasciata*, Fabr.

One female, June 20, San Rafael.

Third antennal joint three or more times as long as the second. Facial ridges ciliate, with strong bristles extending up to a point opposite lowest frontal bristles.

Length 11½ millim.

I am aware that Dr. Williston has shown that there is great variation in these two forms of *Belvosia*, and that intergradations of all kinds exist. I think it is well, however, to apply the two names and differentiate the forms when they can be separated. When specimens are encountered which cannot be so separated they should be mentioned individually, with details as to their variation from the typical form.

21. *Phasiapteryx Bilimeki*, B. & B.

One male, March 9, San Rafael.

Length 7 millim.

This specimen seems to be more robust and bristly than van der Wulp's specimens described in the Biol.-Centr. Am., Dipt. It differs as follows from van der Wulp's description of *Neoptera* (Biol. Centr.-Am., Dipt. ii. pp. 165-166):—The frontal bristles are not hair-like. There is a pair of short decussate vibrissæ. The bristles on third and fourth abdominal segments can certainly be properly called macrochaetæ. The wings agree well with description, except that the curvature of fourth vein does not form a right angle, but is rounded. Apical cross-vein is a little concave. The foot-claws and pulvilli are not short, but rather elongate. Claws black, pulvilli yellow-fuscos.

Van der Wulp's figures of male wing (Biol. Centr.-Am., Dipt. ii. pl. iv. figs. 11, 11 a) show the third vein altogether too strongly arcuate in 11 a, hardly enough so in 11, and, especially in the latter, with a too much narrowed apical cell, to agree with my specimen.

Although the vibrissæ are so distinct and the bristles all

so much stronger than indicated by van der Wulp, there is no doubt that the present specimen is the same species, as the peculiar wing-characters cannot be mistaken. The generic characterization must be changed somewhat, however, especially as regards the presence of distinct vibrissæ.

Dexiidæ.

22. *Euantha dives*, Wd.

Euantha dives, Wd., v. d. Wulp, Biol. Centr.-Am., Dipt. ii. p. 249.

Two males, March 6 and 16, San Rafael. They differ from v. d. Wulp's description only as follows:—

Subtrigonal spot of cheeks brownish, not well defined. Coxæ reddish yellow. Tegulæ pale, with yellowish tinge.

Length $12\frac{1}{2}$ millim.

In v. d. Wulp's synoptic table of Dexiidæ, in the Biol. Centr.-Am., Dipt., he puts *Euantha* in section without costal spine on wings. *E. dives* certainly bears a spine on costa just before end of auxiliary vein. He also makes synopsis read for *Euantha* "wings unicolorous," which is evidently a typographical error. I am sorry to find that I inadvertently perpetuated these errors in my synopsis of Dexiidæ in Trans. Am. Ent. Soc. xix. p. 275. The table there given should be corrected in accordance with the above.

V.—The Classification of Oribatidæ.

By A. D. MICHAEL, F.L.S.

A PAPER by Dr. A. C. Oudemans has appeared in the Tijdschr. voor Entomologie entitled "List of Dutch Acari, Latr., first part Oribatei, Dug., with synonymical notes and other remarks." It is always a pleasure to acarologists to see a paper by Dr. Oudemans upon the creatures which they study, and more especially so when the paper is written in a language more familiar to most biologists than Dutch is. This paper is chiefly upon the Oribatidæ, and is, in many respects, very useful; but as it seeks to make numerous changes in the nomenclature of genera, species, anatomical parts, &c., and in classification, I shall probably be expected to answer it. This I will endeavour to do so far as I think the paper requires an answer.

Firstly, I may fairly congratulate Dr. Oudemans on his knowledge of the English language, in which the paper is

Lists of local fauna are very useful, and acarologists will be glad to have one of the Dutch species, which have not been before recorded; although we could scarcely anticipate that they would vary much from those of Germany and England, as the distribution of these minute beings is usually wide; but when, out of 68 species, 25 are inserted thus: "*Oribates* sp.," without a word of description or any figure, and three thus, "Gen. ? sp. ?" also without description or figure, I fear that the value of the list is considerably diminished.

Dr. Oudemans, in the title above quoted, does not state what value he intends his groups to have; but he calls "*Acari*" what I imagine he considers the order; the next lower group (which I suppose he considers the family) he names "*Oribatei*," and in his list he calls the next still lower group (which is apparently a subfamily) "*Phthiracarea*." These terminations do not appear quite consonant with modern classification. I imagine him to give the values stated to his groups because he calls those of equivalent values to his *Phthiracarea* "*Nothrinæ*" and "*Oribatinæ*." Why one subfamily should end in "-ea" and the others in "-inæ" is not stated. Doubtless Dugès, writing in 1834, did call his family "*Oribatei*," raising Latreille's genus *Oribata* (or *Oribates*) into a family: but Latreille did not call his group *Acari*, as in the heading of Dr. Oudemans's paper; he called it first "*Acares*" and afterwards "*Acaridiæ*," as correctly stated at p. 58; but there it is said, in reference to "*Acares*," "though this term has a French final syllable it is a pure Latin word" (the italics are mine), "it is the plural of the Latin *Acarus*." This somewhat surprises me; I was under the impression that "*Acares*" was the plural of the French word "*Acare*," and that the word, although derived through Latin, was from the Greek word for a Mite *ἄκαρι*, as used by Aristotle, and was founded upon *ακαρῆς*, uncuttable.

Dr. Oudemans says that *Phthiracarus*, Perty, should be substituted for the genus *Tritia*, Berlese, because both are founded on a *Hoplophora* with tridactyle claws and Perty's is the earlier. I by no means assert that *Tritia* is a necessary genus; I did not adopt it, and I am strongly of opinion that the distinction of monodactyle and tridactyle claws has almost entirely broken down as a means of differentiating genera in the Oribatidæ, although it is useful in identification. I believe that this is now the general opinion; but if Berlese's genus have any validity it arises from the remarkable fused and elongated genital and anal plates, so exceptional in the Oribatidæ, and not from the tridactyle

claw. Perty's species, judging from the drawings made by him and published by Claparède in 1868, had the ordinary genital and anal plates of *Hoplophora*, and no specimen of the Hoplophorinæ has ever been found by anyone else, that I am aware of, having the tridactyle claw and the ordinary genital and anal plates of *Hoplophora*. Perty, in defining his genus, includes two important characters which do not exist in any known species of Oribatidæ, viz., six-jointed legs and a sucking-mouth. Therefore if we adopt the genus *Phthiracarus* we adopt one founded upon erroneous anatomy, and of which there is not any known species. Claparède is probably right in supposing that Perty made mistakes about the tridactyle claw and in other matters: his species was probably *Hoplophora dasypus* (Dugès), an earlier species, misdescribed—it is therefore scarcely a satisfactory type for a family; and if we be forced to abandon the well-known name of *Hoplophora*, for which there are very strong arguments, but which every one is unwilling to do, it will be unfortunate.

Then Dr. Oudemans says that the genus "*Notaspis*" cannot stand because Hermann's name in 1804 is equivalent to Latreille's earlier name *Oribata* (or *Oribates*): but it is not certain that they quite covered the same ground; both were very large groups, practically intended to include what we now call the family, and they have been much subdivided. Latreille's group has been raised to a family, and his generic name preserved for one genus; but Hermann knew of many creatures not known to Latreille, and Nicolet is, I think, to be commended for preserving Hermann's name for a portion of these creatures contained in his group, taking the well-known *Notaspis bipilis* as his type.

Dr. Oudemans then states that *Oppia*, Koch, is founded on *Oppia glaucina*, Koch, a larval form, as a type. It is a larval form; but why is it Koch's type? Koch gives 5 species, of which 4 are adult; in his 'Uebersicht,' where he first describes the genus, he puts *O. nitens* at the head of his description and figures that species only. It is true that he used the name "*Oppia*" earlier, in his 'Deutschlands Crustaceen &c.,' without defining the genus: that book was published in fasciculi of loose sheets; both species were in the same fasciculus; the plate of *O. glaucina* was numbered 9, that of *O. nitens* 10; but is this to make the larval form the type? I do not think that the genus *Oppia* should stand, but that is because it is a part of the genus *Notaspis* as limited by Nicolet, and is ill-defined, other members of the same natural genus being spread by Koch over several genera mixed with quite different creatures.

Dr. Oudemans accuses Nicolet of "bungling" over the genus "*Cepheus*": what he did is certainly singular, but the result has to be considered. Dr. Oudemans says, "The name *Cepheus*, Nicolet, 1855, cannot be kept, as Koch used this name in 1836." This is quite true, but we do not attempt to preserve any genus *Cepheus* of Nicolet, nor did Nicolet propose to found any; we preserve Koch's. It is true that Nicolet divided Koch's genus and carried, or rather thought he carried, Koch's *Cepheus latus* to a new genus and called the creature *Tegeocranus cepheiformis*, which he described and figured excellently. It was certainly an odd proceeding; but, as I pointed out in my 'British Oribatidæ,' vol. ii. 1888, p. 340, although Nicolet thought that his species was the same, he was in error: *T. cepheiformis* was a new species, and *Cepheus latus*, Koch, was probably a synonym either of what is now called *Tegeocranus latus*, endeavouring to preserve Koch's specific name, or of *Cepheus tegeocranus* (Hermann), an earlier species. Nicolet named a new species *Cepheus latus*, which was very injudicious: but Koch's definition of the genus *Cepheus* is no description at all, and would not define any group whatever, and his type species is uncertain; it is therefore better to adopt Nicolet's clear definition of the genus, and some zoologists would call it "*Cepheus*, Nicolet." As the facts stand, therefore, it would seem that Nicolet's species may be good, particularly if the notes to rule 14 of the rules for the scientific naming of animals of the German Zoological Society be right. But *Cepheus latus*, Nic., is so like *Cepheus tegeocranus* (Herm.), that Koch would not have been likely to note the difference; thus *Cepheus latus*, Koch and Nicolet, may after all be identical, although Nicolet thought them different. It would be impossible to say for certain from Koch's description and figure.

Dr. Oudemans, like many other acarologists, suggests that the genus *Belba*, founded by Heyden, should take the place of the later genus *Damæus*, Koch. *Belba* was founded on *Notaspis corynopus* Hermann, as a type: Dr. Oudemans says, "I do not know this species by my own observation." Everyone else is in the same position, because probably no such creature as Hermann has figured and very shortly described ever existed; if it did it was not a member of any known genus of Oribatidæ, for it is described as having chelate tarsi. Hermann doubtless made some mistake; but if this error were eliminated the creature, if it were then a possible one, which is doubtful, would belong to the genus *Notaspis* rather than *Damæus*. Heyden, however, was not satisfied with the type; he defined the genus *Belba*, and his definition would carry it out of the Acarina altogether, if

not out of the Arthropoda—it is, “head, protothorax (*sic*), and metathorax separate.” I do not think it would be desirable to revive this genus.

Dr. Oudemans says that “the Oribatei wait for a thorough revision,” and he gives instances. He says that members of the genus *Nothrus* are said to have three claws, but that he has species with one. I think that the tridactyle claw as part of the definition of the genus has long been abandoned; he will find three monodactyle species described in my ‘British Oribatidæ’ in 1888. Then he says that “amongst the species of Koch belonging to the genus *Oribates* there are several of which the wing-like expansions are not movable and do not protect the legs.” Many of the pteromorphæ are only slightly flexible, very few are, strictly speaking, movable; but Koch’s species without them have been removed from the genus by, I think, all modern acarologists. Then he says that “many *Eremaeus* have no arched abdomen, but a hollow one”; he will find in my definition of the genus, in 1888, “*Notogaster* arched or concave in the centre.” Then there are some remarks about the similarity of the nymphs of *Leiosoma* and *Cepheus*, and he suggests that the genera should be joined. If he refer to my work so often quoted above he will find that they practically are joined, but I feel doubts whether they will not have to be separated again; and if Dr. Oudemans endeavours to classify the Oribatidæ by the hairs on the nymphs, I fear he will find that he must neglect important structural differences in the adults. Finally, Dr. Oudemans says, in effect, that the anterior portion of an *Acarus* cannot be called a cephalothorax because some of the creature’s legs are abdominal: I regret to say that I fail to appreciate the cogency of this argument.

It will be seen that the above remarks are written in the spirit that it is better not to make changes in well-known names unless it is unavoidable.

Now a few words as to the species in the list. There are 40 named species; of these three, viz. *Nothrus pallens*, Koch, *Zetes ephippiatus*, Koch, and *Zetes fuscomaculatus*, Koch, are founded upon immature (nymphal) forms. *Hoplophora lucida*, Koch, is one of the many synonyms of *Hoplophora dasypus*, Dugès. *H. nitens*, Nic., is stated to be equivalent to *H. dasypus*, Claparède, but not to *H. dasypus*, Dugès; but Claparède only quotes Dugès and does not use the name *dasypus* at all, he uses *contractilis*. No reason is given for saying that *H. nitens*, Nic., is not the same as *H. dasypus*, Dugès; Nicolet said it was, and I do not know of any reason for disagreeing with him. Five species of *Leiosoma* are

given; the specific names of three of them end in "-us": *σώμα*, the body, is neuter; therefore these names should end in "-um." But at least two of the five, viz. *Zetes flavipes*, Koch, and *Oribates fuscus*, Koch, surely belong to the genus *Notaspis*, not *Leiosoma*: then one is stated to be *Leiosoma nitens*, Geoffr.; should not this be Gervais? In the next genus *Cepheus*, *Carabodes coriaceus*, Koch, is introduced; but I cannot see how it can be considered a *Cepheus*, no explanation is given. In the genus *Pelops*, *P. fuliginus*, Koch, is given instead of *P. levigatus*, Nic.: this may be correct, for they are probably identical, and Koch's is the earlier name; but if so, Koch described this species three times—first as *Pelops acromios*, Herm., which it is not, then as *P. fuliginus*, and, finally, in all probability, as *P. hirsutus*: his figures and descriptions hardly render certain identification possible, and it would be far better, if it can be done, to preserve Nicolet's name, which has a good description and figure attached to it. In the genus *Oribata* (or *Oribates*) Dr. Oudemans adopts the masculine termination, but he leaves almost all the species in the feminine: thus he puts "*Oribates pallidula*, Koch," and *O. fuscomaculata*, Koch; but I do not think that Koch put adjective specific names in the feminine when his genus was masculine. *Oribata coleoptrata* (Linn.) is used instead of Hermann's well-known name of *alata*; but the species entirely relies on Hermann's drawing, and although it is customary to suppose that it may have been the *Acarus coleoptratus* of Linnaeus, it is far too uncertain to adopt that name and drop Hermann's. Both *Oribates ovalis*, Koch, and *O. nitens*, Nic., are given; it is very doubtful if these be more than varieties.

It must not for a moment be supposed from these remarks that I underestimate the value of many of Dr. Oudemans's suggestions.

VI.—Contributions from the New Mexico Biological Station.

—III. The Bees of the Genus *Colletes* found in New Mexico. By T. D. A. COCKERELL.

A. Rather large forms of the type of *C. inæqualis*, with dark, often scarcely banded abdomen in ♀.

- (1) No dark hairs on thorax; a sharp straight transverse keel behind the enclosure at base of metathorax.

Colletes utilis, sp. n.

♀. Length 11 millim., anterior wing 7½ millim.

Stoutly built, black; the rather long pubescence of face,

cheeks, pleura, base of abdomen, and legs greyish white or very pale grey, that of vertex and dorsum of thorax yellowish ochraceous. Face broad, with erect pale grey pubescence except on clypeus and middle of supraclypeal area, which are bare. Clypeus with elongate irregular punctures, the surface between them striate, the sculpture reminding one of the surface of a strawberry. Supraclypeal area shining, with two longitudinal rows of large subconfluent punctures on each side. Vertex very closely and distinctly punctured. Space between eyes and base of mandibles about twice as broad as long. Mandibles black, with a dark rufous ring, tips blunt, notch a fair distance from tip. Labrum with three or four short longitudinal grooves on each side; no central pit. Antennæ wholly dark, flagellum with a very fine sericeous pubescence, first joint of flagellum distinctly longer than second. Thorax quite densely pubescent above; prothoracic spines horizontal, long and slender, easily overlooked amidst the pubescence. Mesothorax moderately shiny, median groove very well marked; punctures very large and distinct, separated from each other by intervals about equal to the diameter of one. Pleura shiny, with strong punctures. Enclosure at base of metathorax very short, coarsely longitudinally plicate, bounded behind by a straight transverse keel. Tegulæ rufo-testaceous. Wings perfectly hyaline, nervures and stigma black. Legs entirely dark, the claws only rufescent, spurs pale brownish. Basal joints of tarsi fairly but not remarkably stout. Pubescence at tips of inner side of tarsi more or less rufous. Abdomen short and stout, hind margin of second segment and slightly of first and third narrowly rufous. Punctuation of first two segments strong and rather close, on a shining surface; of third extremely fine and small, on a microscopically tessellate surface. No hair-bands, but base of first segment with long hairs. Hind trochanters with a thin long curled brush of beautifully ramose hairs.

Hab. Las Cruces, N. M., March 23, on flowers of plum.

(2) With dark hairs on thorax.

(a) Tegulæ piceous, punctuation very strong and close; wings smoky.

Colletes bigeloviae, sp. n.

♀. Length 11 millim., anterior wing $7\frac{1}{2}$ millim.

Very much like *C. armata*, but at once distinguished if attention is given to the following points:—The flagellum is entirely dark beneath, at most very obscurely brownish or rufescent. The unpunctured middle of the supraclypeal area

is sometimes quite dull, sometimes shiny. The face is but sparsely hairy. Head very broad on vertex. Prothoracic spine well formed. Mesothorax very coarsely and densely punctured, so as to be cancellate; median smoother shiny area not much developed. Tegulae dark vandyke-brown. Wings smoky, nervures and stigma black. Pleura very densely punctured, so as to be cancellate. Abdomen with white hair-bands at base of second and apex of second and following segments, all largely rubbed off in my specimens.

Hab. Mescalero Indian Reservation, Sacramento Mountains, N. M., a short distance below the Agency, rather common at flowers of *Bigelovia graveolens*, var. *glabrata*, Oct. 2, 1896.

This is certainly very near to *armata*, but the slightly larger average size, dark flagellum, smoky wings, and very densely punctured mesothorax may be taken as valid specific characters.

- (b) Tegulae rufo-testaceous, punctuation not so close; wings perfectly clear; flagellum brown beneath; stigma rufo-fuscous.

Colletes armata, Patten, 1879.

One female, Las Cruces, N. M., late summer or early autumn.

Mr. Fox, after comparing it with Cresson's collection, marked it *C. inaequalis*, but Mr. Robertson has since shown that what Cresson took for *inaequalis* was really *armata*. I have the real *inaequalis* from Illinois (Robertson); it is larger, with dark tegulae and other differences. In several respects (wings, antennae, tegulae) it is more like *bigeloviae*, but it has the mesothorax shiny, with the punctures separate though close, very different from *bigeloviae*.

- B. Males as large or larger than *inaequalis*, with black hairs on dorsum of thorax and very large punctures on abdomen.

Colletes gilensis, sp. n.

♂. About 15 millim. long.

Black, the pubescence of head and thorax quite dense except on posterior truncation of thorax, long, greyish white or very pale grey on underparts, tinged with ochreous and mixed with black on thoracic dorsum, dense and silky on lower part of face, covering clypeus. Face longer than broad. Antennae wholly dark. Vertex shining, with sparse big punctures and little ones between. Mandibles dark, rather blunt, the notch a fair distance from the end. Clypeus

with very large irregular pits. Labrum with a deep elongate median sulcus, bounded on each side by an elevation. Area between eyes and base of mandibles about twice as broad as long. Mesothorax shining, with large well-separated punctures. Prothoracic spine long and conspicuous. Base of metathorax with the usual transverse series of pits, rather irregular, below which the triangle is transversely ridged, with a rather feeble median longitudinal carina. The shiny downward prolongation of the triangle is very narrow. Lateral areas of the posterior truncation dull because minutely roughened. Tegulae rufo-fuscous. Wings long (anterior wing 10 millim.), smoky; nervures and stigma very dark fuscous. Legs black, small joints of tarsi inclining to dark rufous. Pubescence of legs ordinary. Abdomen shiny, with large close punctures; first segment sparsely clothed with erect grey hairs, which on the other segments are replaced by shorter inconspicuous hairs, becoming darker to black caudad. Apical margins of segments 1 to 5 with even very conspicuous bands of white pubescence. The band is wholly lacking on sixth segment. Pubescence of apex fuscous. Venter with white bands like those of dorsum.

Hab. West fork of Gila River, N. M., July 16, two males (C. H. T. Townsend).

It is to be regretted that the female of this, the largest New Mexico *Colletes*, is unknown. A specimen was compared by Mr. Fox with the Cresson collection, and returned marked "near *propinqua*." From the male of *inaequalis* (*propinqua*) it differs by its rather larger size, smooth vertex with sparse punctures of two sizes (that of *inaequalis* being dull from the very dense punctuation), strong prothoracic spine, larger punctures of abdomen, &c.

C. *Smaller species with well-banded abdomen and without black hairs on thorax, except in a vernal species* (C. *toxana*, Cr.).

- (1) Distance between eyes and base of mandibles greater than breadth of latter.
- (a) Larger; tips of mandibles blunter; punctuation of first abdominal segment stronger and closer.

Colletes Wootoni, sp. n.

♂. About 10 millim. long.

Black, with long, rather dense, greyish-white pubescence, tinged with ochreous on vertex and dorsum of thorax. Eyes unusually prominent, giving the head an odd appearance viewed from in front. Face and cheeks densely covered with

long dull white hairs. Clypeus shining, with sparse but very distinct punctures. Labrum with a median elevation. Vertex closely and strongly punctured. Space between eyes and base of mandibles longer than breadth of latter, striated. Mandibles rufous at extreme tips, which are blunt; notch deep and not far from end. Second and third joints of maxillary palpi conspicuously shorter than first or fourth. Flagellum wholly dark, its first joint about two thirds length of second. Mesothorax shining, with large, rather sparse punctures; hind part of scutellum densely punctured; post-scutellum with fine longitudinal ridges, crossed by finer ones, producing a curious cancellate appearance. Base of metathorax with a series of large elongated pits, separated by sharp keels, the whole bounded behind by a distinct but irregular ridge. Lower part of triangle with a shining depression. Lateral faces of truncation shining, with irregular shallow punctures. Articulating base surrounded above by a smooth area, with radiating keels. Tegulae shining dark brown, with very hairy margins. Wings perfectly hyaline, nervures and stigma piceous, stigma very small. Legs black, with long dull white hairs. Abdomen shining, strongly and rather closely punctured; first segment with long greyish-white hairs; apical margins of segments 1 to 5 with bands of white pubescence, which are continued but very narrowly on venter. Pubescence of extreme apex subfuscous. No black hairs on dorsum of hindmost segments.

Hab. Ruidoso Creek, N. M., 6400 feet, July 8, on a small-flowered *Asclepias* (E. O. Wootton).

A pollen-mass of the *Asclepias* is adherent to one of the hind tarsi. Near to *C. compacta*, Cr., ♂, but that has dark hairs on thorax and has not the strong series of pits at base of metathorax.

- (b) Smaller; tips of mandibles sharper; punctuation of first abdominal segment feebler and more sparse.

Colletes daleae, sp. n.

♂. About 7 millim. long.

Black, with abundant long white pubescence, duller on dorsum of thorax, but nowhere tinged with ochreous. Eyes very prominent. Face densely covered with silky white hair. Clypeus quite closely punctured, especially down the middle. Labrum with a conspicuous central pit. Mandibles rufous at tips. Space between mandibles and eye coarsely striated, a little longer than broad. Sides of vertex densely

punctured. Antennæ reaching to base of metathorax; flagellum dark, only faintly brownish beneath. Mesothorax shining, with distinct but sparse punctures. A short prothoracic spine. Scutellum shining, its hind third closely punctured. Base of metathorax shining, bounded by a ridge, and separated into quadrate spaces by irregular longitudinal ridges. Posterior truncation shining, the lateral areas sparsely pitted and clothed with long beautifully plumose hairs. Tegulæ testaceous, edges paler. Wings perfectly hyaline; nervures and stigma dull testaceous, subcostal nervure black. Legs black, with sparse white pubescence; tarsi obscure brownish. Abdomen shining, first segment sparsely punctured, the following segments not so sparsely but more obscurely; first segment with long dull white hairs, replaced on following segments by short inconspicuous pubescence, nowhere anything but white. Pubescence of apex white. Segments 1 to 6 with very distinct apical bands of white pubescence, which are continued narrowly on venter.

Hab. Mesilla Park, N. M., June 2, 1896, on flowers of *Dalea scoparia*. Also Las Cruces, N. M., in the town, June 9, 1894.

This must be very near to *C. producta*, Rob., ♂, but that has black tegulæ, and the scutellum is different.

(2) Distance between eyes and base of mandibles less than breadth of latter; much less except in the vernal species.

(a) Pubescence of thorax short, the hairs stout, pubescent, moss-like; abdominal bands broad and appressed; tips of mandibles blunt.

Colletes aberrans, sp. n.

♀. Length about 11 millim.

Black, with short, tolerably dense, pale ochreous pubescence. Head rather broad, vertex depressed; clypeus prominent, practically bare, with punctures running into grooves; face above clypeus with short ochreous pubescence; vertex with a very few large punctures on a surface which appears granular from an exceedingly minute punctuation; ocelli large; cheeks with short pubescence, that on occiput somewhat longer, not at all mixed with black. The occipital hairs at first seem simple, but a strong lens shows that they are minutely feathered all the way up. Antennæ wholly dark. Mandibles strongly grooved without, medially sub-rufous, very blunt at tips, with the notch a fair distance from the end. Labrum with no distinct median pit. Thoracic dorsum densely covered with pubescence except a central

space on mesothorax and the anterior part of scutellum, both of which exhibit rather sparse very large punctures, and the pitted base of the metathorax. The posterior truncation is quite hairy all over. The hairs on the mesothorax, scutellum, and postscutellum are very short, thick, and moss-like; many are tipped with brown, but this looks like some accidental staining in the cyanide bottle. None are black. These peculiar hairs are very pubescent and result from a shortening of the axis of the hair without a reduction in the number of the lateral cilia, so that the latter become crowded. Tegulae dark testaceous, pubescent in front. Wings perfectly hyaline; nervures and stigma dark rufous, subcostal nervure black. Third submarginal cell more oblique than usual. Legs tolerably densely pubescent; the hind femora carry a quantity of pollen. Abdomen rather elongate, with short pubescence, reminding one of *Epeolus*. Segments 1 to 4 have broad greyish-white apical bands, 2 and 3 have also broad basal bands, greyer in colour. The first segment is so pubescent that the ground-colour appears as a dark band just before the marginal band. The surface of the abdomen, where exposed, is dullish, closely and minutely punctured. The hair-bands are not continued on to the ventral surface.

Hab. Santa Fé, N. M., July 27, 1895, on flowers of *Petalostemon candidus*; one specimen, no others seen (*Chll.* 3820).

Very easily known by the remarkable character of the thoracic pubescence. The *P. candidus* was at the same time and place visited by *Sphex* and *Bombus*, the latter in fair numbers, gathering the orange pollen.

(b) Pubescence of thorax normal.

- (i.) Dorsum of thorax with some black hairs; punctuation of first abdominal segment excessively sparse.

Colletes texana, Cresson, 1872.

Las Cruces, N. M.; one female on *Salix*, May 2.

Cresson's description, from a single example found in Comal Co., Texas, is rather inadequate, but it tallies precisely with our insect, except that I should not call the wings "short." Length about 10 millim. There is a band at the base of the second abdominal segment, not mentioned by Cresson. Nervures and stigma piccous. Antennae wholly black.

Distinguished from *compacta* ♀ by the entire band at apex of first abdominal segment, &c.

(ii.) Dorsum of thorax without any black hairs.

a. Small males, with flagellum ferruginous beneath; tarsi ferruginous.

Colletes prosopidis, sp. n.

♂. Length about 7 to 8½ millim.

Very near to *C. daleæ*, the description of which, given above, applies with these exceptions:—The space between eyes and base of mandibles is broader than long. Sides of vertex are sparsely punctured. The flagellum is ferruginous beneath. Hind third of scutellum only sparsely punctured. Base of metathorax sometimes as in *daleæ*, sometimes not distinctly separated into quadrate spaces. Nervures and stigma fuscous or stigma dark ferruginous. Knees and all the tarsi ferruginous, knees sometimes black, hind tibiæ sometimes ferruginous behind. Second abdominal segment with very distinct punctures.

Hab. Las Cruces, N. M.; five at flowers of mesquite (*Prosopis*), May 2; one on foliage of *Populus*, Campus of Agricultural College, May 8 (*Chil.* 2942).

β. Flagellum dark; tarsi little if at all ferruginous, except in *C. Anna*.

† Punctuation of first abdominal segment feeble and sparse.

§ Cinereous species; no hair-band at base of second abdominal segment in the males. (Compare also *C. salicicola*.)

Colletes Louisaæ, sp. n.

♂. Length about 8 millim.

Black, with rather dense greyish-white pubescence, stoutly built, not slender like *daleæ* and *prosopidis*. Head rather broad, vertex distinctly convex seen from in front; face densely covered with long silvery white hair; sides of vertex strongly but sparsely punctured; labrum with three longitudinal grooves, the lateral ones strongest. Mandibles dark, rather unusually slender, the notch some distance from the tip; space between eyes and mandibles a little broader than long. Antennæ wholly dark, not so long as in *daleæ* and *prosopidis*. Pubescence of thorax tolerably dense, but not particularly long; mesothorax with rather sparse but very large and distinct punctures; scutellum sparsely punctured, densely on hind margin; base of metathorax bounded by a sharp ridge and divided by sharp ridges into quadrangular spaces. Prothoracic spine absent or concealed by the pubescence. Tegulæ shining fuscous, finely punctured. Wings perfectly hyaline; nervures and stigma fuscous, subcostal

nervure black. Legs black, ordinary, claw-joint becoming ferruginous. Abdomen short, convex, suboval, shining, with small and sparse but distinct punctures. No black hairs. First segment with long hairs at base and sides; segments 1 to 5 with very distinct white apical bands of appressed hairs, which bands are continued somewhat more narrowly on the venter. First joint of flagellum almost as long as second.

Hab. A few miles E. of Las Cruces, N. M., below the rise, Sept. 27, 1896 (*Chil.*; C 1).

Colletes gypsicolens, sp. n.

♂. Length about 11 millim.

Closely related to *Louisæ*, but considerably larger, and the dorsal pubescence of the head and thorax has a very delicate yellowish tinge, not readily noticed under the lens, but contrasting with the white paper lining of the store-box, giving the insect a quite distinct *facies*. Another peculiarity is found in the mandibles, the rufescent ends of which are broad and flattened, pointed at the tip, like a Roman sword. The labium has merely a shallow median pit or concavity. Sides of vertex closely and minutely punctured. Flagellum entirely black. No prothoracic spine. Mesothorax with large, rather close punctures. Enclosed quadrangles of base of metathorax very few, the middle ones at least considerably broader than long. Lateral areas of posterior truncation shining, hairy, punctured. Tegulæ extremely hairy. Wings perfectly hyaline; nervures black, stigma pale ferruginous or honey-colour. The wings are relatively somewhat shorter than in *Louisæ*. Tarsi sometimes more or less ferruginous, especially the hind tarsi, which may be conspicuously so. Abdominal punctures very minute. White bands very broad and distinct. Hind margin of sixth segment hyaline.

Hab. White Sands by Whitewater, N. M., on flowers of *Bigelovia*, Oct. 6, four males (*C. H. T. Townsend*; C 36).

This interesting species is probably peculiar to the White Sands, an enormous deposit of pure gypsum extending for many miles, looking exactly like banks of snow.

Colletes, sp. n.

♀. Length about 10 millim.

Abdomen narrow, elongate, tapering, after the manner of *C. nitidus*, Smith, with very distinct white hair-bands. When the segments are extended it is seen that the bases of the second and third are hairy. I give this form no name, as

I have no doubt it will prove to be the female of *Louisæ*, *daleæ*, or *prosopidis*. It is most like *Louisæ*, and, by analogy with *nitidus*, should have a male with the abdomen shaped as in *Louisæ*; the latter, however, flies at a different time of year and has a more distinctly punctured abdomen. More probably, perhaps, the present insect belongs with *daleæ*, which flies at the same season; but against this supposition is the difference in the length of the space between the eye and mandible. The dark flagellum (faintly brown beneath) and tarsi suggest *daleæ* rather than *prosopidis*.

It had been queried whether this insect might be Cresson's *albescens*, but that has the abdomen "very closely" punctured, which certainly is not true of our species. The nervures of our insect also are piceous or black, not "rufo-testaceous," while our tegulæ are clear testaceous, those of *albescens* being piceous.

Hab. San Marcial, N. M., two specimens, June 28, 1895 (*Ckll.* 3101, 3112); Las Cruces, N. M., one, June 8, 1894, in the town (*Ckll.* 866); another on parsnep, June.

§§ Ochreous species of small size; base of second abdominal segment hairy; tarsi ferruginous.

Colletes Annæ, sp. n.

♂. Length about 8 millim.

Black, with dense ochraceous pubescence, becoming white on the cheeks and femora. Head broad; face densely covered with pubescence, which has a distinct yellowish tinge. Antennæ long, wholly black; first joint of flagellum very short, scarcely more than half as long as second. Sides of vertex inconspicuously and rather sparsely punctured. Mandibles stout, rufous at ends, blunt at tips, notch a fair distance from tip. Space between eye and mandible unusually short, more than twice as broad as long. Labrum with an obscure median pit. Mesothorax with very large and distinct, not very close, punctures. Base of metathorax with quadrate spaces, broader than long, enclosed by a sharp rim. Posterior truncation shining. Tegulæ rufo-testaceous, very pubescent. Wings perfectly hyaline, iridescent; nervures and stigma ferruginous. Second submarginal cell very little narrowed above. Legs black, with all the tarsi and the extreme ends of the tibiæ ferruginous; tarsi ciliated with long hairs. Abdomen rather narrow and elongate, very hairy, with minute punctures, sparse on first segment, and nowhere dense. First segment covered with long hair; segments 1

to 5 with very broad apical bands of light ochraceous pubescence, base of second segment also hairy. Ventral hair-bands very narrow at sides, widening to the middle.

Hab. Mesilla, N. M., Aug. 29, 1896, on flowers of *Bigelovia Wrightii*.

From the male of *C. americana* this will be known by the colour of the legs. One would take it for the undescribed male of *C. ciliata*, Patton, but for the very strong punctuation of the thorax.

†† Punctuation of first abdominal segment strong, feeblest and sparsest in a species from *Salix* (*C. salicicola*).

§ Lateral faces of posterior truncation of thorax dull; the shiny triangle narrowed below.

x. Larger; hind spur of hind tibia barely ciliate.

Colletes æstivalis, Patton, 1879.

Ruidoso Creek, N. M., 6600 feet, July 10, on *Rhus*, six females, one male (*E. O. Wooton*).

These differ in no important respect from a specimen of *æstivalis* from Illinois, received from Mr. Robertson.

xx. Smaller; hind spur of hind tibia very finely but very distinctly pectinate.

Colletes chamcesarachæ, sp. n.

♀. Length about 10 millim.

Black, with short dull grey pubescence. Head tolerably broad; eyes not bulging at top; face and cheeks with sparse grey pubescence; clypeus bare, shining, strongly but not very densely punctured; sides of vertex sparsely punctured, shining; a broad dull groove in front of the upper part of each eye; labrum with a deep median longitudinal furrow; mandibles stout, rounded at tips, the notch near the end; space between mandible and eye very short; flagellum dark brown beneath from the third joint to the end, its second joint shorter than the third and only half as long as the first. Prothoracic spine rather short, but very slender and sharp. Mesothorax with very large close punctures, absent on disk. Anterior half of scutellum impunctate, posterior half with large punctures. Base of metathorax divided by ridges into quadrate spaces which are longer than broad. Lateral faces of posterior truncation irregularly and obscurely reticulate, dullish because microscopically lineolate or subreticulate.

Pleura closely punctured, subcancellate. Thoracic pubescence short and rather sparse, dull yellowish grey or, one might say, pale greyish ochreous. Tegulae shining piceous, not noticeably punctured. Wings hyaline; nervures piceous, stigma fuscous. Legs with mouse-coloured pubescence; tarsi dark; tibial spurs dark brown; hind spur of hind tibia pectinate, with about fifteen teeth. Inner tooth of claw short, diverging from the outer. Abdomen rather narrow, subconical, moderately shiny, punctuation of first segment fine but strong and rather close, of the remaining segments minute and obscure. Base of first segment sparsely hairy; hind margins of segments 1 to 4 with bands of whitish pubescence; second segment very feebly pubescent at extreme base. Venter with rather abundant fairly long mouse-grey pubescence.

Hab. Santa Fé, N. M., at flowers of *Chamaesaracha coronopus* in grounds of Capitol, Aug. 2 (*Coll.* 4081).

The punctuation of the first abdominal segment is conspicuously finer than in *estivalis*.

§§ Lateral faces of posterior truncation of thorax shining or tuberculate, not minutely roughened.

α. Punctuation of first abdominal segment relatively sparse and fine; vernal species.

Colletes salicicola, sp. n.

♀. Length about 10 millim.

Stoutly built, black (including tarsi), with rather short but abundant pale grey or greyish-white pubescence, faintly tinged with yellowish on dorsum of thorax. Head tolerably broad, but hardly as broad as thorax; vertex depressed, its sides sparsely punctured, contrasting with the closely punctured front. Pubescence of face and cheeks tolerably abundant "frightened mouse" colour. Clypeus with very large sparse punctures. Antennae wholly dark, first joint of flagellum not twice as long as second. Mandibles wholly dark, blunt. Labrum with a round median pit. Space between eye and base of mandible about twice as broad as long. Prothoracic spine apparently wanting. Mesothorax with large, rather sparse punctures. Base of metathorax with numerous spaces, longer than broad, enclosed by ridges. Sides of posterior triangle obliquely ridged. Lateral faces of posterior truncation shining, distinctly but sparsely punctured. Tegulae pale testaceous, shining. Wings perfectly hyaline; nervures and stigma black, costal nervure brown. Second submarginal

cell narrower than usual. Legs with pale grey pubescence, white on first four femora. Tibial spurs pale; hind spur of hind tibia barely ciliate. Abdomen broad, suboval, shining; first segment with very distinct but very sparse punctures; second segment more closely punctured, the punctures perfectly distinct on a shining surface; first segment with a thin pale grey pubescence all over; segments 1 to 5 with broad apical bands of white hair, which are not continued on to the venter. Bases of segments also pubescent. No black hairs.

Var. *a*.—Posterior triangle of thorax without ridges.

Hab. Las Cruces, N. M., on *Salix*, May 2 and 3.

This is much like *Louisæ*, but flies at a different time of year. In *salicicola* the stigma is black, in *Louisæ* it is ferruginous and tapers more at the end. There is little difference in the punctuation of the abdomen. *O. Louisæ* has conspicuous white ventral hair-bands, which are wholly lacking in *salicicola*.

xx. Punctuation of first abdominal segment relatively strong and close; summer and autumn species.

Colletes americana, Cresson, 1868.

I have several lots of specimens which must be referred to *americana*, for, although they present differences among themselves, I fail to find satisfactory specific characters to separate them. Nevertheless, it is probable that one or two segregates may be established hereafter with close study of more abundant material. The specimens referred to are:—

- (1) A female from Watrous, N. M., 6200 feet, July 13. Peculiar for its sharp mandibles, with the notch very distinct and a good distance from the end. Abdomen very pubescent, including bases of second and third segments.
- (2) A female, Las Vegas, N. M., July. Mandibles blunt, with the notch very near the end. Abdomen hairy, as in the Watrous example.
- (3) Six males, Tuerto Mountain, near Santa Fé, N. M., 7850 feet, Aug. 7, flying over damp sand in numbers. Mandibles sharp, notch near end.
- (4) A male, Santa Fé Cañon, N. M., 7625 feet, on flowers of *Rudbeckia laciniata*, Aug. 11.
- (5) Santa Fé, N. M. One female, Mr. Boyle's garden, July 25, 1895, at flowers of *Sphæralcea angustifolia*. One male, July 25, 1894. One male, July 18, at white *Clematis* flowers.

- (6) A female, west fork of Gila River, N. M., July 16 (*C. H. T. Townsend*). This looks like a distinct species, but Mr. Fox, after comparing it with the Cresson collection, refers it to *americana*. The abdomen is not so hairy as in the others, and the hair at the bases of the segments after the first is lacking. The punctures on the second segment are conspicuously finer and closer than those on the first.
- (7) Mesilla, N. M., two males on *Bigelovia Wrightii*, Aug. 29, 1896.
- (8) Las Cruces, N. M., two males on *Bigelovia Wrightii*, end of August. Two males on *Solidago canadensis* by Schaublin's mill, Sept. 3 and 4.

Mesilla, New Mexico, U.S.A.,
Nov. 14, 1896.

*

VII.—*On Cteniform Spiders from the Lower Amazons and other Regions of North and South America, with List of all known Species of these Groups hitherto recorded from the New World.* By F. O. PICKARD CAMBRIDGE, B.A.

[Plates III. & IV.]

CONTENTS.

	Page
(i.) Introduction.....	53
(ii.) a. Bibliography relating to the Cteniform Spiders of the New World.....	54
b. List of new Species and other Forms more especially noted.....	54
(iii.) Descriptions and Notes.....	56
Part I.—(a) Genera of the Old and New Worlds, containing forms possessing two tarsal claws only, which have been assigned by various authors to the Ctenidae and Clubionidae, with Notes on the Type Species.....	56
(b) List of Genera and Species of the New World, with Descriptions of new Species.....	60
Part II.—(a) Genera of the Old and New Worlds of Forms possessing three tarsal claws, which have been assigned by various authors to the Families Ctenidae and Lycosidae, with Notes on the Type Species.....	86
(b) Characters of a new Genus and Descriptions of new Species from the New World.....	95
Part III.—Cribellate "Ctenoid" Forms referred by Simon to Fam. Zoropsidae, with two tarsal claws; Notes and Descriptions of new Species from the New World....	101

(i.) Introduction.

The following pages contain descriptions of a new genus and twenty-two new species of spiders, one male new to science of a species already described, and notice of two forms renamed, since the original names were bestowed on forms of whose identity we have now no real clue.

Of the new species thirteen, not including the new male form, have been placed provisionally under the generic name *Ctenus*; for five species the new genus *Lycotenus* has been established, containing three-clawed Dolomedine forms; one new species has been added to Keyserling's genus *Stenotenus*, in all probability congeneric with *Labdacus*, O. Cambr.; one new species has been added to this latter genus and two to the genus *Acanthoctenus*, Keys.

The two forms referred by Count Keyserling to *Phoneutria rufibarbis* and *P. fera*, Perty, sub *Ctenus*, have been re-named *Pertyi* and *Keyserlingii* respectively. The original descriptions and figures of *rufibarbis* and *fera* given by Perty leave no real clue to the particular forms he had before him, and there is no alternative other than re-naming the two forms which Keyserling referred to Perty's names.

As to the real character of the original genus *Ctenus*, Walck., with its type *C. dubius*, Wlk., there is room for much doubt. In 1884 M. Simon records the existence of this type in the Museum at Paris, but now (October 1896) he regrets to say that this type, as well as those of other of Walckenaer's "*Ctenidæ*," have entirely disappeared. M. Simon, in 1884, says that Walckenaer's *Ctenus* was congeneric with those included under that name by Keyserling. One of Keyserling's species—*C. bogotensis*—however, is a three-clawed form, entering the family Lycosidæ or Pisauridæ according to M. Simon's more recent classification; while another of Keyserling's species of *Ctenus* is congeneric with M. Simon's own genus *Cupiennius*, 1891, which, however, he has lately kindly informed me will fall into *Ctenus* according to his present characterization of the latter.

Of spiders collected in the Amazons Valley during the expedition in Mr. Alexander Siemens's S.S. 'Faraday,' I am able to record therefore ten new species and one new genus, while descriptions of twelve other new species have been added, all from South and Central America, except *C. minimus* from North America.

No attempt has been made to determine the exact systematic position of the three groups into which the "*cteniform*" spiders fall—a matter which is still in hot dispute amongst

arachnologists. The "cribellate" forms have been placed provisionally in the family furnished for their reception by M. Simon in his second edition of the 'Natural History of Araneæ'—the Zoropsidæ.

I have to thank Mr. R. I. Pocock, of the Natural History Museum, South Kensington, for kindly allowing me to examine the collection of Arachnida under his charge and to describe the new forms discovered.

(ii.) a. *Bibliography relating to the Cteniform Spiders of the New World.*

- 1805.—C. A. WALCKENAER. 'Tableau des Araignées.'
 1833.—GRIFFITH. 'Anim. Kingdom (Cuvier).'
 1833.—M. PERTY. 'Del. Anim. Brasil.' (Spix and Martins), iii.
 1837.—C. A. WALCKENAER. 'Insectes: Aptères,' i.
 1841.—N. M. HENTZ. Boston Soc. Journ. Nat. Hist. iv.
 1848.—O. KOCH. 'Die Arachniden,' xv.
 1872.—M. TACZANOWSKI. Horæ Soc. Ent. Rossicæ, ix.
 1873.—M. TACZANOWSKI. Horæ Soc. Ent. Rossicæ, x.
 1873.—O. PICKARD CAMBRIDGE. Proc. Zool. Soc. Lond., Jan.
 1875.—N. M. HENTZ. 'Spid. United States,' ed. Burgess.
 1877.—E. VON KEYSERLING. Verhand. z.-b. Gesell. Wien, t. ii. (viii.).
 1878.—L. KOCH. 'Arachniden Australiens,' ii.
 1878.—KAHSCH. Z. ges. Natur. (3) iii.
 1879.—E. VON KEYSERLING. Verhand. z.-b. Gesell. Wien.
 1879.—KAHSCH. Zeitschrift ges. Naturwiss. (3) iv.
 1880.—PH. BERTKAU. Mém. Cour. Acad. Belgique, t. xliii.
 1880.—E. VON KEYSERLING. Verhandl. z.-b. Gesell. Wien, xxix.
 1880.—EUGÈNE SIMON. Bull. Soc. Zool. Fr.
 1880.—E. VAN BENEDEEN. Bulletin Acad. Belg. (2) xlix.
 1881.—HOLMBERG. Ann. Soc. Argentina.
 1881.—E. VON KEYSERLING. Verhand. z.-b. Gesell. Wien.
 1882.—A. W. M. VAN HASSELT. IV. 3de Afl. Nat. Historie Midden-Sumatra. Leiden.
 1884.—EUGÈNE SIMON. Ann. Mus. Genov. xx.
 1886.—EUGÈNE SIMON. Bull. Soc. Zool. Fr. ii.
 1887.—VAN HASSELT. Tijdschrift voor Entomologie, xxx.
 1888.—VAN HASSELT. Tijdschrift voor Entomologie, xxxi.
 1888.—EUGÈNE SIMON. Ann. Soc. Ent. Fr. viii.
 1891.—E. VON KEYSERLING. Brasilienische Spinnen.
 1891.—EUGÈNE SIMON. Bull. Soc. Zool. Fr. xvi.
 1892.—O. PICKARD CAMBRIDGE. Biol. Centr.-Americana, Arach. p. 100.

(ii.) b. *List of new Species and other Forms more especially noted.*

Genus CTENUS (♀ Walck.).

- C. Reidyi*, sp. n., ♀.—Santarem, Lower Amazonas. P. 78, Pl. III. figs. i. a, ii.
C. Andrewsii, sp. n., ♀.—Santarem and Pará, Lower Amazonas. P. 79, Pl. III. fig. ii. b.

- C. boliviensis*, sp. n., ♂ ♀.—Bolivia, S. America. P. 80, Pl. III. fig. iii.
C. Pertyi, nom. nov., = *C. rufibarbis* (Perty), Keys. P. 80.
C. Keyserlingii, nom. nov., = *C. ferus* (Perty), Keys. P. 81, Pl. III. fig. ii. c.
C. nigriventer, Keys.—Rio Grande do Sul, Brazil. P. 81, Pl. III. fig. ii. d.
C. nigrifus, sp. n., ♂.—Santarem, Lower Amazons. P. 81, Pl. III. figs. vi. a, vii. a.
C. annulipes, sp. n., ♂ ♀.—La Palma, Costa Rica. P. 84, Pl. III. figs. iv. d, vi. a, vii. f.
C. rectipes, sp. n., ♂.—Iguarassu, Brazil. P. 85, Pl. III. figs. vi. a, vii. b.
C. spiculus, sp. n., ♂.—Colombia. P. 86, Pl. III. figs. vi. g, vii. h.
C. serratipes, sp. n., ♂.—Demerara. P. 87, Pl. III. figs. vi. c, vii. d.
C. plunipes, sp. n., ♂.—Santarem, Lower Amazons. P. 84, Pl. III. figs. vi. b, vii. c.
C. medius, Keys. (♂ new to science).—Theresiopolis, S. Brazil. P. 87, Pl. III. figs. vi. f, vii. g.
C. minimus, sp. n., ♂.—N. America. P. 86, Pl. III. fig. v. l and 2.
C. minor, sp. n., ♀.—Santarem, Lower Amazons. P. 83, Pl. III. fig. iv. c.
C. albofasciatus, sp. n., ♀.—Santarem, Lower Amazons. P. 82, Pl. III. fig. iv. b.
C. similis, sp. n., ♀.—Santarem, Lower Amazons. P. 83, Pl. III. fig. iv. a.

Genus CUPINIENUS, Sim.

- C. oculatus*, Sim., = *C. Saléi* (Keys.), sub *Ctenus*. P. 68.

Genus LYCOCTENUS, new.

- L. brunneus*, sp. n., ♂ ♀.—Santarem, Lower Amazons. P. 97, Pl. IV. figs. i. a, i. c, 2, ii. a, c.
L. gigas, sp. n., ♂.—Hab. doubtful: Upper Amazons? P. 98, Pl. IV. fig. i. c, 1.
L. denierarensis, sp. n., ♂.—Demerara. P. 99, Pl. IV. fig. i. c, 3.
L. colombianus, sp. n., ♂.—Colombia. P. 99, Pl. IV. fig. i. c, 4.
L. Hewitsoni, sp. n., ♂ ♀.—Santarem. P. 100, Pl. IV. fig. i. b.
L. bogotensis, Keys., ♀.—Bogotá. P. 98, Pl. IV. fig. ii. d, b.

Genus STENOCTENUS, Keys.

- S. pallidus*, sp. n., ♂.—Aimable Maria, Peru. P. 92, Pl. IV. fig. v. a, b.

Genus LABDACUS, O. Cambr.

- L. albidus*, sp. n., ♀.—Rio de Janeiro, S. Brazil. P. 91.

Genus ACANTHOCTENUS, Keys.

- A. Marshii*, sp. n., ♂ ♀.—Santarem &c., Lower Amazons. P. 103, Pl. IV. figs. iii. a, c, iv. a.
A. Ridleyi, sp. n., ♀.—Pernambuco. P. 103, Pl. IV. figs. iii. e, iv. b.
A. spinigerus, Keys., ♂.—Mexico. P. 102, Pl. IV. fig. iii. b.
A. spinipes, Keys., ♀.—Bogotá. P. 103, Pl. IV. fig. iii. d.

PART I.—(a) *Genera of the Old and New Worlds, containing Forms possessing two tarsal claws only, which have been assigned by various authors to the Families Ctenidæ and Clubionidæ, Subfam. Cteninæ, with Notes on the Type Species.*

1805. *Ctenus*, Wlk. Tableau Aran. p. 16. Type *C. dubius*, Wlk., ♀.—Cayenne, French Guiana.*
1833. *Phoneutria*, Perty, Del. Anim. Bras. iii. p. 196. Type *P. ferox*, Perty, ♀.—Rio Negro, Brazil.
1833. *Thaumasia*, Perty*.
1875. *Argoctenus*, L. Koch, Arach. Austr. ii. p. 990. Type *A. igneus*, L. K., ♀.—King George's Sound, Australia.
1875. *Leptoctenus*, L. Koch, Arach. Austr. ii. p. 994. Type *L. agalenooides*, L. K., ♂.—Gayndah, Australia.
1877. *Microctenus*, Keys. Verh. z.-b. Ges. Wien, p. 687. Type *M. ornatus*, Keys., ♀.—Bogotá, New Granada.
1877. *Acanthoctenus*†, Keys. Verh. z.-b. Ges. Wien, p. 693. Type *A. spinigerus*, Keys., ♂.—Bogotá, New Granada.
1877. *Caloctenus*, Keys. Verh. z.-b. Ges. Wien, p. 696. Type *C. aculeatus*, Keys., ♀.—Bogotá, New Granada.
1878. *Ænigma*, Karsch, Z. ges. Naturw. (3) iii. p. 825. Type *Æ. australiana*, Karsch, ♀.—New South Wales.
1879. *Anahita*, Karsch, Verh. Rhein-Provinz. iv. p. 103. Type *A. fauna*, Karsch, ♀.—Japan.
1880. *Isoclenus*, Bertk. Mém. Cour. Acad. Belg. xliii. p. 61. Type *I. foliiferus*, Bertk., ♀ juv.—Brazil.
1880. *Ctenophthalmus*, Sim. Ann. Soc. Ent. Belg., Bull. p. 174. Type *C. lineatus*, Sim., ♀.—New Caledonia.
1890. *Ctenomma*, Thor. Ann. Mus. Genov. p. 133, nom. for *Ctenophthalmus*, Sim., nom. preocc.
1891. *Cupiennius*, Sim. Bull. Soc. Zool. Fr. xvi. p. 109. Type *C. Getazi*, Sim., ♀.—Costa Rica.
- 1891-92. *Nydia*, Thor. Rag. Mal. iv. vol. ii. p. 130. Type *N. punctata*, Thor., ♀ juv.—Sumatra.
- 1891-92. *Acantheths*, Thor. Sven. Ak. Handl. xxiv. (2) p. 61, note. Nom. for *Acanthoctenus*, Thor. Type *A. variatus*, Thor., ♀.—Sumatra.

* 1833. *Thaumasia*, Perty, Del. Anim. Bras. iii. p. 192, tab. xxxviii. 5. Type *T. scutis*, Perty, ♂.—Provincia Piahiensi, Brazil.

There is no evidence as to whether this is a two-clawed or three-clawed form.

† Although *Acanthoctenus* does not at present claim kindred with the Cteninæ, I have left the name in this position for convenience' sake.

Notes on the Types of the above Genera.

CTENUS, Walck.

There is no question that the type of this genus is *C. dubius*, Walck., Tabl. Aran. 1805, p. 16, it being the only species here assigned to the genus. As to the identity of the type form, M. Simon says:—"Le *Ctenus dubius*, Wlk., type du genre *Ctenus* (Tabl. Ar.), qui existe encore au Muséum de Paris, rentre dans la division à laquelle le comte Keyserling a laissé le nom de *Ctenus*," and "Il est synonyme du genre *Phoneutria*, Perty" (Ann. Mus. Genov. 1884, p. 355)*.

Without, however, having seen the type of the genus, one would not like to be too sure of its affinities. Keyserling included all those ctenoid forms which were characterized by four or five pairs of spines beneath tibiae i. and ii. under *Ctenus*, Walck., in his more recent work Bras. Spinn. 1891. Possibly this extension would include *C. dubius*, Walck. In 1877, however, when Keyserling first differentiates the Ctenoid genera, he includes under *Ctenus*, with four pairs of subtibial spines, as distinct from *Microctenus*, with five pairs, three species only—*C. granadensis*, *C. bogotensis*, and *C. Salzi*. The first and the third belong to *Cupiennius*, Sim., while the second belongs to the new genus *Lycotenus*. So that I use the generic term *Ctenus* in this paper with mental reservations as to future possibilities.

PHONEUTRIA, Perty.

Walckenaer, in Ins. Apt. i. p. 369-70, includes both Perty's species under his older genus *Ctenus*, though he regards the former as distinct from the latter, in so far as concerns the curvature of the second row of eyes, straight in *Ctenus dubius*, recurved in *Phoneutria*.

Neither C. Koch, who describes and figures three forms to which he gives the names respectively *P. fava*, Perty, *P. ochracea*, C. K., and *P. rufibarbis*, Perty (Die Arach. xv. pp. 60, 62, and 64), all from Brazil, nor Keyserling, who figures the vulva of a species under the name *P. rufibarbis*, Perty (Verh. zool.-bot. Ges. Wien, 1881, p. 575, pl. xvi. fig. 21), definitely selects the type of *Phoneutria*; neither, subsequently, does either Gerstäcker, Simon, Karsch, Holmberg, or Bösenberg, each of whom assigns one or more species to this genus, select the type.

* M. Simon kindly sends me the following information, Oct. 20, 1896:—"Je n'ai pas retrouvé au muséum les types de *Ctenus jancirus*, *sanguineus*, *rufus*, *fuscus*, et *dubius*, Walckenaer, qui sont bien sûr perdus."

It is necessary, then, in case the genus should ever be re-established, to select one of the two species described under it by Perty as the type.

Although *P. rufibarbis* is the species first described, I am compelled to conclude that, unless the original type turns up, neither its generic affinities nor its specific identity will ever, or can ever, be established with any real certainty.

In coming to this conclusion one has to remark that in the figure of the eyes of *rufibarbis* (l. c. pl. xxxix. fig. 2) the anterior laterals are omitted, thus leaving us entirely in the dark as to the character of the eye-formula, while the figure of the spider is wholly unrecognizable; nor do the descriptions assist us to make good the deficiency in this respect.

Neither does the only definite character offered of the spider itself in the description help us to identify the species; and although it is probable that Perty is describing one of the larger *Ctenina*, there is no certainty in the matter. He says "*ochracea, chelicornubus rufo-hirtis*," a coloration which is to a greater or less extent characteristic of several other large species. There is, however, one character which, if it appeared on any form of large *Ctenus*, would go far to substantiate its identity—"abdomine albo-punctato. Seriebus tribus longitudinalibus punctorum alborum"—a character which receives double significance from Perty's figure. I am inclined to think that the artist fancied the picture incomplete without a middle row of spots between the two usually found in certain species of the genus; but if one is found so decorated, my conclusion would need reconsideration. At present it is characteristic of none of the forms yet taken and assigned to *rufibarbis*.

There are before us, then, three distinct species to which this character "*chelicornubus rufo-hirtis*" would equally apply—the one to which Keyserling has assigned the name *P. rufibarbis*, Perty, of whose vulva he publishes a figure in Verh. zool.-bot. Ges. Wien, 1881, p. 575, pl. xvi. fig. 21, and two species, with bright red hairs on the mandibles, from the Amazons. Keyserling probably concluded that his specimen was Perty's *rufibarbis* on account of this character, which is common to these three species at least; and I am thus compelled to conclude that *P. rufibarbis*, Perty, is a "*forma ignota*," whose specific characters are not recognizable. This being the case, I shall have much pleasure in naming *P. Pertyi* the form to which Keyserling assigned the name *P. rufibarbis*.

One cannot but conclude that its generic affinities also are no longer to be known with any *certainty*, whatever the

probability may be; and I therefore select *P. fera*, Perty, as the type of the genus *Phoneutria*.

The next question is, What are the generic and specific affinities of *this* form?

The figure (pl. xxxix. fig. 3) of the eye-formula leaves us in no doubt whatever that it is one of the forms which we now class as *Ctenidæ*. But, curiously enough, I have not yet, amongst some hundreds of examples from Messrs. Salvin and Godman's collection from Central America, from Keyserling's collection from South America, and from my own specimens collected on the Amazons, met with a single one whose eye-formula agrees with Perty's figure.

In this figure the second row of eyes is strongly *recurved* (concavity backwards). In all the New-World forms I have been able to examine this row is either *straight* or *procurved*.

It is a curious fact, however, that of numbers of *Cteninæ* which have come before me from the Old World, very many forms from Africa do present exactly the character claimed in virtue of Perty's figure for *Phoneutria*.

This fact undoubtedly accounts for the assignment of several African species by a number of authors to this genus.

I do not say that this eye-formula does not exist in the New World; but I do say that the genus *Phoneutria*, if separated from *Ctenus*, Walk., can only be done so on this character, as the authors in question have done, and any New-World form assigned to the genus or to the species *P. fera*, Perty, must present this character unmistakably.

The type of the form to which Keyserling assigned the name *Phoneutria fera*, Perty, is now before me, and in this specimen the second row of eyes is most distinctly *straight*. It cannot be called *fera* of Perty, and I have much pleasure in connecting with it the name of Count Keyserling, and shall refer to it below as *Ctenus Keyserlingii*.

As to the specific identity of the true *P. fera*, Perty, one is compelled to regard it as a "forma ignota" also, though its generic relations are certain so far as the eye-formula is concerned. Keyserling probably concluded that Perty's figure was erroneous; most likely it is, but without any description bearing out such a conclusion, one has no right to assume it to be so.

M. Simon has remarked of *Ctenus dubius*, Walck., that "il est synonyme du genre *Phoneutria*." This may be so, but only if we include all forms with eyes of the second row straight or recurved under one comprehensive generic group.

For the present, there being no immediate necessity for deciding whether *Phoneutria* should be regarded as a synonym

of *Ctenus* or not, since we know of no New-World species which we can with certainty assign to this genus, I would prefer to leave it an open question.

I have felt it necessary to enter thus minutely into the matter because one ought not to rename forms which already have been assigned certain names without making quite clear one's reason for so doing.

The type of *Thaumasia*, Perty, is *T. senilis*, Perty, being the only species described under this generic title. *Leptoctenus agalenoides*, L. K., is the only species originally assigned to the genus; while of the two species of *Argoctenus*, L. K., *igneus* and *pictus*, the type not having been mentioned, I select the first-named as the type of the genus; but of the four forms originally assigned to *Microctenus* by Keyserling, I select the first, *M. ornatus*, Keys.; while *Caloctenus aculeatus*, Keys., is the only species described in 1877, and therefore will be the type of *Caloctenus*, Keys. The type of the obscure genus *Anahita*, Karsch, since assigned by Keyserling to his interpretation of *Ctenus*, Walck., is the species *A. fauna*, Karsch, from Japan, being the only form then described. *Isoctenus foliiferus*, Bertk., ♀ juv., from Brazil, transferred by Keyserling to *Ctenus*, Wlk., is the only species described by Bertkau, and must be its type. Of *Ctenophthalmus*, Sim., for which, being a nom. preocc., Thorell proposed (Ann. Mus. Gen. 2, xi. (xxx.) 1891-92) the name *Ctenomma*, *C. lineatus*, Sim., remains alone as its type. Of the three species described under *Cupiennius*, Sim., who has not definitely selected the type, I select the first described, *C. Getazi*, Sim. The single species described by Thorell under *Nydia*, *N. punctata*, Thor., remains the type; while of *Acanthoctenus*, Keys., *A. spinigerus*, K., the only species originally assigned, is the type. Of *Acantheis*, Thor., a name substituted for *Acanthoctenus*, Keys., Thor., under which the single species *A. variatus*, Th., was originally described, this species remains the type. *Ænigma*, Karsch, has the single species, originally assigned to it, *Æ. australiana*, Karsch, as the type.

PART I.—(b) *List of Genera and Species of the New World, with Descriptions of new Species.*

Genus CTENUS, Walck., 1805.

1805. *Ctenus dubius*, Wlk. ♀ ♂, 20 mm. Type of genus. Tabl. Ar. p. 18, pl. iii. figs. 21, 22. Spec. in coll. Mus. Paris. Cayenne.

1833. *Ctenus Walckenaerii*, Griffith. ♀. An. King. Cuvier,

pp. 417 and 426, t. xiii. There is no description, but a figure only, of one of the larger *Cteninæ*. *Hub. ignota*.—Walckenaer, *Ins. Apt.* ii. p. 459, doubts its distinctness from *C. janeirus* ♂. If he is right, Griffith's name has priority. (Pl. III. fig. 2.)

1837. *Ctenus fimbriatus*, Walck. ♀, 17.5 mm. *Ins. Apt.* i. p. 364. Cape of Good Hope, Africa.—Has been selected by M. Simon as the type of (*Titurius*) *Thalassius*. He informs me, however, that the type no longer exists.

1837. *Ctenus janeirus*, Walck. ♀, 16 mm. *Ins. Apt.* i. p. 364. South America, Rio de Janeiro.—It seems not improbable that this species belongs to the *Lycosidæ*, for Walckenaer mentions the great height of the clypeus, though no mention is made of the number of tarsal claws.

1837. *Ctenus sanguineus*, Walck. ♀, 23 mm. *Ins. Apt.* i. p. 365. South America, Brazil.

1837. *Ctenus unicolor*, Walck. ♂, 18 mm., ♀. *Ins. Apt.* i. p. 365. Brazil, Rio de Janeiro, and San Sebastian.—Walckenaer mentions that the palpal organs resemble those of the male of *Segestria*, and regards the species as identical with *Dolomedes concolor*, Perty. If this is the case, the latter name, of course, has priority.

1837. *Ctenus rufus*, Walck. ♀, 14.5 mm. *Ins. Apt.* i. p. 367. South America, French Guiana.—Possibly a *Lycoctenus*.

1837. *Ctenus fuscus*, Walck. ♀, 9 mm. *Ins. Apt.* i. p. 368. South America, French Guiana.—Possibly a *Lycoctenus*.

1837. *Ctenus rufibarbis* (Perty), Walck. ♀, 32 mm. *Ins. Apt.* i. p. 369. Rio Janeiro, Brazil.

1837. *Ctenus ferus* (Perty), Walck. ♀, 34 mm. *Ins. Apt.* i. p. 370. Rio Negro, Brazil.—Walckenaer accurately describes the eye-formula which he considers should be characteristic of Perty's *Phoneutria*, though he includes both these forms under his own more comprehensive *Ctenus*, merely distinguishing them as a separate group of the genus. Keyserling has expressed an opinion that Walckenaer was wrong in attributing this eye-formula to *Phoneutria*. Walckenaer could but follow Perty's figure, however convinced he might be that the figure itself was erroneous, unless he was in the position to give a fresh diagnosis of the genus from the original type.

Mr. F. O. P. Cambridge on *Cteniform Spiders*

1848. *Ctenus cinnamomeus*, C. K. ♂ juv.?, 27 mm. Die Arach. xv. pp. 5-8, fig. 1457. Loc. ignota.—Possibly this species belongs to *Lycotenus*. The eyes suggest the genus *Thalassius*, Sim., but Koch makes no mention of the tarsal claws. The legs are 4, 1, 2, 3, according to his figure.
1848. *Ctenus concolor* (Perty), C. K. ♀, 17.5 mm. Die Arach. xv. p. 59, fig. 1458. Brazil.—C. Koch regards this species as identical with *Dolomedes concolor*, Perty, and *C. unicolor*, Wlk. The legs appear to be 4, 1, 2, 3, according to Koch's figure, and it very likely belongs to *Lycotenus*.
1841. *Ctenus hibernalis*, Hentz. ♂, 13 mm. Bost. Soc. Journ. Nat. Hist. iv. p. 393. New Mexico.
1875. *Ctenus hibernalis*, Hentz. Spid. U. S. p. 35, pl. v. figs. 1-4. S. Alabama.
1841. *Ctenus punctulatus*, Hentz. ♀, 7 mm. Bost. Soc. Journ. Nat. Hist. iv. Alabama.
1875. *Ctenus punctulatus*, Hentz. Spid. U. S. p. 35, pl. v. figs. 5, 6. Texas, Arizona.
- 1873-4. *Ctenus giganteus*, Tacz. ♀, 45 mm.; ♂, 26 mm. Horæ Soc. Ent. Rossicæ, x. p. 91. Cayenne (♀ juv.), St. Laurent de Maroni (♂).—This appears to be, as Taczanowski surmises, the largest known species of *Ctenus*, though one would doubt the possibility of identifying it with any certainty from the description.
- 1873-74. *Ctenus bimaculatus*, Tacz. ♀, 11 mm. Horæ Soc. Ent. Rossicæ, p. 92. Uassa, N.E. corner of Brazil, close to French Guiana.—It is next to impossible to identify this species from the description, and, since the number of tarsal claws are not mentioned, it is equally difficult to judge of its systematic position. From the following passage, however,—“Corselet brun marron, largement bordé de fauve”—one would suspect it to belong to *Lycotenus*, with *Dolomedine* characters. The following character may be of assistance towards future identification:—“Abdomen brun foncé, orné de deux grosses taches reniformes fauves blanchâtres. Pattes 4, 1, 2, 3.”
1875. *Ctenus rufibarbis* (Perty), Holmberg. Argentina.
1877. *Ctenus Salâi*, Keys. ♀, 27 mm. Verhand. z.-b. Ges. Wien, p. 685, t. ii. (viii.) fig. 53. Type in coll. Brit.

Mus. Nat. Hist. London. Mexico, Vera Cruz, and Cordova. A specimen also from Guatemala in coll. Keyserl.—This type ♀ is identical with a number of females from Messrs. Salvin and Godman's collection from Guatemala; one of these, submitted to M. Simon in Oct. 1896, was pronounced by him to be identical with his *Cupiennius oculatus*, 1891. The name *Saldi* therefore will have priority, and I retain the generic title given to this group by M. Simon for the present.

1877. *Ctenus granadensis*, Keys. ♂, 16 mm.; ♀, 15 mm. Verhand. z.-b. Ges. Wien, p. 682, t. ii. (viii.) fig. 51. Type in coll. Brit. Mus. Nat. Hist. London. New Granada, St. Fé de Bogotá.—This species belongs to the group of Cteninæ to which Simon has given the name *Cupiennius*. It appears to be closely allied to his *C. celerrimus*; since, however, there are no figures given, and the description is inadequate for the purpose, I am unable to settle the point.

1877. *Ctenus bogotensis*, Keys. ♀, 27 mm. Verhand. z.-b. Ges. Wien, p. 684, t. ii. (viii.) fig. 54. Type in coll. Brit. Mus. Nat. Hist. London. New Granada.—This species does not belong to the Cteninæ, but to *Lycotenus*, having three tarsal claws and other Dolomedine characters.

1880. *Ctenus cyclothorax*, Bertk. ♂, 19 mm. Mém. Acad. Belg. t. xliii. p. 56, pl. i. fig. 18. Tijuca, Brazil.—Keyserling refers this species to his genus *Caloctenus*, Bras. Spinn. 1891, p. 143, since tibiae i. & ii. bear seven pairs of long spines beneath. He says:—"Ctenus cyclothorax, Bertk., gehört in die Gattung Caloctenus." Bertkau considers it = Walckenaer's group *Ambigua*, including *C. janeirus* ♀, and that it is probably the male of *C. janeirus*, while *C. cinnamoneus*, C. K., is the immature male of it.

1881. *Ctenus argentinus*, Holmb. ♀, 27 mm. An. Soc. Argent. p. 271. Argentina, Buenos Aires.—The spider, Holmberg remarks, is closely allied to *Ctenus bogotensis*, Keys., and *C. Saldi*, Keys. His excellent description shows that it very probably belongs to the same group as *Saldi* (*bogotensis* is a *Lycotenus*), to which Simon gave the name of *Cupiennius*. Holmberg says:—"Femoribus lateribus dorsoque sordide albo nigroque viperino-maculatis. Patellarum tibiarumque minus conspicuis lateribus notatis." This character would prove that it is probably distinct from *Saldi*, Keys., = *oculatus*, Sim., but very

closely allied to *Getazi*, Sim. He adds, "Abdomine . . . duabus maculis punctiformis, ventre quatuor lineis pallide rufescentibus prope basin nascentibus, mamillasque versus convergentibus signato." These characters ought to help an identification, except that it is not easy to see what is meant by "duabus maculis," whether two only, or two on either side; if the latter, it shares this character with *Saldæ*. Holmberg also remarks that tibiæ i. and ii. possess 2, 2, 2, 2, metatarsi i. with 2, 2, 3, metatarsi ii. with 2, 2, 1, 2 spines beneath; also "mandibularum rima (aut canali) cum crista externa, seu postica, 4-dentata." Thus showing clearly its affinities to *Cupiennius*.

1881. *Ctenus rubripes*, Keys. ♀, 28 mm. Verhand. z.-b. Ges. Wien, p. 577, pl. xvi. fig. 23. Type in coll. Dr. Koch, Nürnberg. Central America, Panama.—Since, according to Keyserling, this species has four pairs of spines under the anterior tibiæ and also two lateral ones (in the female sex), it is not improbable that it belongs to *Cupiennius*, close to *C. grandensis*, Keys. The type is not in the Museum.

1884. *Ctenus oculifera* (Karsch), Sim. See sub *Phoneutria oculifera*, 1879. Mexico.

1887. *Ctenus hybernalis*, Hentz, V. Hasselt. ♀ juv. Tijds. Ent. p. 227. Recorded from the Island of Curaçao, Antilles.

1891. *Ctenus nigriventer*, Keys. ♀, 30 mm. Bras. Spinn. p. 144, t. iv. fig. 98. Type in coll. Brit. Mus. Nat. Hist. London. Rio Grande do Sul (*Dr. v. Ihering*).—This form is very closely allied to *C. boliviensis*, sp. n., described below, as well as to *C. Keyserlingii*. The external plate of the vulva is, however, shorter in proportion to the breadth than in either of the two latter species (*cf.* Pl. III. fig. ii. d, below).

1891. *Ctenus ferus* (Perty), Keys. ♀, 30 mm. Bras. Spinn. p. 145. Type in coll. Brit. Mus. Nat. Hist. London. Rio de Janeiro (*Dr. Göldi*).—I need not here repeat my reasons for changing the name of this species to *C. Keyserlingii* (*cf.* sub *Phoneutria fera*, Perty, above). I may add, however, that it is very unlikely that a species found at Rio Janeiro would be identical with one taken on the Rio Negro. The vulva having never to my knowledge been figured, I give one from Keyserling's type (*cf.* Pl. III. fig. ii. c).

1891. *Ctenus vehements*, Keys. ♀, 15·6 mm. Bras. Spinn. p. 146, t. iv. fig. 99. Type in coll. Brit. Mus. Nat. Hist. London. Espirito Santo, Brazil (*Dr. Göldi*).
1891. *Ctenus ornatus*, Keys. Bras. Spinn. p. 146. See sub *Microctenus* below. Neu Freiburg.—N.B. The date 1876 quoted in Bras. Spinn. as that of the Vienna publication is not correct; it should be 1877. Type in coll. Dr. Koch, Nürnberg.
1891. *Ctenus velox*, Keys. ♂, 10·7 mm. Bras. Spinn. p. 147, tab. iv. fig. 100. Type in coll. Brit. Mus. Nat. Hist. London. Atto da Serro, Neu Freiburg (*Dr. Göldi*). —Keyserling does not mention the spur on the posterior coxæ which distinguishes this form from all other males which I have seen.
1891. *Ctenus brevipes*, Keys. ♀, 11·4 mm. Bras. Spinn. p. 148, t. iv. fig. 101. Type in coll. Brit. Mus. Nat. Hist. London. Brazil, Rio Grande do Sul (*Dr. v. Ihering*).
1891. *Ctenus minusculus*, Keys. ♀, 12·3 mm. Bras. Spinn. p. 149, t. iv. fig. 102. Type in coll. Brit. Mus. Nat. Hist. London. Brazil, Rio Grande do Sul (*Dr. v. Ihering*).
1891. *Ctenus longipes*, Keys. ♂, 17·4 mm. Bras. Spinn. p. 150, t. iv. fig. 103. Type in coll. Brit. Mus. Nat. Hist. London. Brazil, Rio Grande do Sul (*Dr. v. Ihering*).
1891. *Ctenus tenuatus*, Keys. ♂, 10·4 mm. Bras. Spinn. p. 151, t. iv. fig. 104. Type in coll. Brit. Mus. Nat. Hist. London. Brazil, Rio Grande do Sul (*Dr. v. Ihering*).
1891. *Ctenus griseus*, Keys. ♀, 20·5 mm. Bras. Spinn. p. 152, t. iv. fig. 105. Type in coll. Brit. Mus. Nat. Hist. London. Brazil, Taquara do Mundo novo (*Dr. v. Ihering*).
1891. *Ctenus medius*, Keys. ♀, 19 mm. Bras. Spinn. p. 153, t. iv. fig. 106. Type in coll. Brit. Mus. Nat. Hist. London (both examples). Brazil, Rio Grande do Sul (*Dr. v. Ihering*), Rio de Janeiro (*Dr. Göldi*).
1892. *Ctenus mordicus*, O. Cambr. ♂, 20 mm.; ♀, 27 mm. Biol. Centr.-Amer., Arach. p. 100, t. xiii. figs. 6, 7. Guatemala.

Genus PHONEUTRIA, Perty, 1838.

1838. *Phoneutria rufibarbis*, Perty. ♀, 32 mm. Del. Anim. Art. iii. p. 197, tab. xxxix. 2. Province of the Rio Negro, Ann. & Mag. N. Hist. Ser. 6. Vol. xix. 5

Brazil.—I have set forth above reasons for considering that there is not sufficient evidence as to the identity of this form. None of the authors who have adopted Perty's name mention that they have seen the original type specimen, so that one can but conclude that their only evidence is drawn from Perty's description and figures. These, in the case of *rufibarbis*, are sufficient neither for generic purposes nor for specific identification. I have very little doubt that the spider figured is one of the three species known to us, characterized by red-haired mandibles and the striped pedipalpi; but one cannot be certain on such slender evidence as is offered to us in the figures.

1833. *Phoneutria fera*, Perty. ♀, 34 mm. Del. Anim. Art. iii. p. 197, tab. xxxix. 3. Province of the Rio Negro, Brazil.—The above remarks apply also to a certain extent to this species. The specific identity cannot be determined. I have little doubt that the figure of the eyes is entirely wrong and that Keyserling was right in his assumption that the two large Cteninæ which he called *ferus* and *rufibarbis* were congeneric with Perty's species. There are several species, however, of both forms, either of which might equally well have been Perty's original form; but no one, not even the "earliest author," has any right to assume that Perty's figure of the eyes is wrong, and to act upon that assumption. If the figure is correct, then Keyserling's *ferus* is not the same as Perty's. I have assumed the figure to be correct, and have therefore given to Keyserling's *ferus* a new name.

1848. *Phoneutria fera*, Perty, C. Koch. ♂, 29 mm.; ♀, 34 mm. Die Arach. xv. p. 60, fig. 1459. Brazil.—Koch's beautiful figure leaves no doubt that he had one or other of the large Cteninæ before him, while the figure of the eyes and the red hue of the mandibles in the full figure suggest the form described below as *C. Reidyi*, though one cannot be certain on this point. I have not met with any form in which the patellæ of the legs are distinctly red as he has depicted them. Whatever this species may be (and possibly the type is still in existence), one cannot consider it *P. fera*, Perty, nor *Ctenus ferus*, Walck., with both of which Koch regards his species as identical.

1848. *Phoneutria rufibarbis*, Perty, Koch. ♀, 29 mm. Die Arach. xv. p. 63, fig. 1461. Brazil.—Judging from the figure, it seems highly probable that this species is identical

with the form described below as *C. Andrewsii*, though there is not sufficient evidence to make it a certainty.

1848. *Phoneutria ochracea*, C. K. ♂, 26.5 mm. Die Arach. xv. p. 62, fig. 1460.—I have not met with any form which agrees with this figure and description. Possibly the type is also in existence.

1879. *Phoneutria oculifera*, Karsch. ♀, 30 mm. Z. ges. Naturw. (3) iv. p. 350, with figure of vulva. Mexico.—Of this species Karsch says:—"der innere Falzrand der Mandibeln trägt, von der Basis der Klaue entfernt, 4 sehr starke schwarze Zähne, während der äussere deren nur 2 besitzt, sehr nahestehenden . . . *Phoneutria Saldi* (Keys.)." Whether this form really belongs to the group to which Simon gave the name *Cupiennius* I cannot say. One would think probably not. The form of the vulva resembles very closely that of *Lycotenus bogotensis* (Keys.) and *L. brunneus*, sp. n.; but, as Karsch makes no mention of the number of the tarsal claws, it is impossible to say for certain. In any case it does not belong to the genus *Phoneutria*, Perty. Simon, in 1884, regards this species as congeneric with (*Titurius*) *Thalassius*, type *T. fimbriatus*, Walck. I have not met with any form of this genus from the New World.

1881. *Phoneutria rufibarbis* (Perty), Keys. ♀, 33.2 mm. Verhand. z.-b. Ges. Wien, p. 576, t. xvi. fig. 22. Type in coll. Dr. Koch. Brazil, Neu Freiburg.—This appears to be a larger spider than that figured and described by Koch. Keyserling mentions the spines of the tibia as five pairs. Keyserling has described this form and figured the vulva, thus giving sufficient evidence that it is neither *Reidyi* nor *Andrewsi*. For reasons given above I have named this latter form *C. Pertyi*, since it cannot bear the name *rufibarbis*.

Genus CUPIENNIUS, Sim.*

1891. *Cupiennius Getazi*, Sim. ♀, 25 mm. Bull. Soc. Zool. Fr. xvi. p. 109. Costa Rica.

* Genus CUPIENNIUS, Simon, 1891.

Tibiae i. and ii. with four pairs of spines beneath, with two lateral spines on each side in ♀ and ♂. Protarsi i. and ii. with three pairs of spines beneath and a single small stout spine at apex beneath in all four pairs. Legs 1—2, 4—3. No dorsal spines above tibiae i., ii., iii., and iv. No spines on patellae i., ii., iii., and iv. Lower margin of fang-groove

1891. *Cupiennius celerrimus*, Sim. ♂, 12 mm.; ♀, 15 mm. Bull. Soc. Zool. Fr. xvi. p. 110. Teffé, Amazons.—Apparently very closely allied to *C. granadensis*, Keys.
1891. *Cupiennius oculatus*, Sim. ♀, 26 mm. Bull. Soc. Zool. Fr. xvi. p. 110. Guatemala.—This species is identical with the next but one, *C. Saldei*, Keys., also from Guatemala; the name *Saldei* has priority. See under *Otenus Saldei* above.
1877. *Cupiennius granadensis* (Keys.)? See sub *Otenus granadensis* above.
1877. *Cupiennius Saldei* (Keys.)? Syn. *C. oculatus*, Sim. 1891. See under *Otenus Saldei* above.

Genus MICROCTENUS, Keys., 1877.

1877. *Microctenus ornatus*, Keys. ♀, 19.7 mm. Verhand. z.-b. Ges. Wien, p. 687, t. ii. (viii.) fig. 62. Type in coll. Dr. Koch. Neu Freiburg, Brazil.—This species was included under *Otenus* by Keyserling in Bras. Spinn. 1891; see above.
1877. *Microctenus obscurus*, Keys. ♀, 17 mm. Verhand. z.-b. Ges. Wien, p. 689, t. ii. (viii.) fig. 58. Type in coll.

with four teeth, upper with three. Second row of eyes procurved. Lateral anteriors midway between posterior centrals and posterior laterals, but not in the same line. Central anteriors one third smaller than posteriors. Ocular quadrangle as broad as long, much narrower in front. Clypeus equal to $1\frac{1}{2}$ diameter of anterior centrals. Tarsal claws 2. Scopula beneath tarsi and protarsi i. and ii., apex of protarsus iii., absent on protarsus iv., present on tarsi iii. and iv. Patella and tibia i. much longer than patella and tibia iv.

Species.

A. Femora of legs spotted or annulated beneath.

1. Femora marked beneath with numerous fine spots, having also an apical annula ♀, 25 mm. *C. Getazi*, Sim.
2. Femora marked beneath with three distinct annulae, two median and one apical ♀, 26 mm. *C. Saldei*, Keys. (*C. oculatus*, Sim.).
3. In all probability add ♀, 27 mm. *C. argentinus*, Holmb.

B. Femora not annulated or spotted.

- a. ♂, 12; ♀, 15 mm. *C. celerrimus*, Sim.
- b. ♂, 16; ♀, 15 mm. *C. granadensis*, Keys.

- Brit. Mus. Nat. Hist. London. New Granada, St. Fé de Bogotá.—Included under *Ctenus* by Keyserling in Bras. Spinn. 1891.
1877. *Microctenus adustus*, Keys. ♀, 11 mm. Verhand. z.-b. Ges. Wien, p. 690, t. ii. (viii.) fig. 58. Type in coll. Brit. Mus. Nat. Hist. London. New Granada, St. Fé de Bogotá.—Included under *Ctenus* by Keyserling in Bras. Spinn. 1891.
1877. *Microctenus parvus*, Keys. ♂, 8.2 mm. Verhand. z.-b. Ges. Wien, p. 692, t. ii. (viii.) figs. 55, 56. Type ♀ in coll. Brit. Mus. Nat. Hist. London. New Granada, St. Fé de Bogotá.—Included under *Ctenus* by Keyserling in Bras. Spinn. 1891.
1881. *Microctenus curvipes*, Keys. ♂, 18 mm. Verhand. z.-b. Ges. Wien, p. 579, t. xvi. fig. 24. Type in coll. Dr. Koch, Nürnberg. Panama.
1887. *Microctenus humilis*, Keys. ♀, 11.4 mm. Verhand. z.-b. Ges. Wien, p. 456, pl. iv. fig. 35. Type in coll. Cambridge Museum, Mass., U.S.A. Central America, Nicaragua.
1886. *Microctenus ravidus*, E. Sim. ♀, 16 mm. Bull. Soc. Zool. Fr. ii. N. Patagonia.—Without figures it is next to impossible to ascertain the species. It belongs, however, to that group in which the second row of eyes is procurved, the ocular quadrangle broader than long. The anterior centrals smaller, closer together, and the clypeus equal to one diameter of anterior central eyes.

Genus ISOCTENUS, Bertk., 1880.

1880. *Isoctenus foliiferus*, Bertk. ♀ juv., 11 mm. Mém. Cour. Acad. Belg. xliii. p. 61. Brazil, Chapeo d'uvas, Rio de Janeiro.—According to Keyserling, Bras. Spinn. 1891, p. 143, this species belongs to *Ctenus*, Keys. Bertkau mentions five pairs of spines beneath tibiae i. and ii., so that very likely there is no real generic distinction; but one cannot say without seeing the type.
1880. *Isoctenus bicolor*, E. van Beneden. ♀ juv., 16 mm. Bull. Acad. Belg. (2) xlix. p. 657. Loc. ignota, probably Brazil.—There is very little evidence as to its identity to be drawn from the description, save that it belongs to the group here characterized as *Ctenus*. "Tibiae i. and ii. with five pairs of spines beneath." Van Beneden himself says "*Ctenus*, Keys., nec Walck."

Genus *Caloctenus*, Keys., 1877.

1877. *Caloctenus aculeatus*, Keys. ♀, 4 mm. Verh. z.-b. Ges. Wien, p. 697, t. ii. (viii.) fig. 59. Type in coll. Brit. Mus. Nat. Hist. London. New Granada, St. Fé de Bogotá. —Having carefully examined the type specimen, I find it to be a *two-clawed* form.
1880. *Caloctenus major*, Keys. ♀, 19 mm. Verh. z.-b. Ges. Wien, p. 337, t. iv. fig. 31. Type in coll. Mus. Warsaw. Peru.
1882. *Caloctenus major*, Keys., Hasselt. IV. 3de Afl. Nat. Historie Midden-Sumatra, pl. v. fig. 13. Figure of vulva.
1880. *Caloctenus variegatus*, Bertk. 15.5 mm. Mém. Acad. Belg. t. xliii. p. 59, t. i. fig. 19. 'Bras. Spinn.' There-siopolis (San Jao de Ré), Brazil.—Since Bertkau remarks that tibiae i. and ii. have seven pairs of spines beneath, it is probable that this spider belongs to the genus in which he placed it, though why he did not also place *cyclothorax* in the same genus does not appear.
1891. *Caloctenus cyclothorax* (Bertk.), Keys. Bras. Spinn. 1891, p. 143, note.—This species belongs, so far as description allows one to judge, to *Caloctenus*, Keys. See sub *Otenus* above.

Genus *Leptoctenus*, L. K., 1875?

1888. *Leptoctenus byrrhus*, Sim. ♀, 11 mm. Ann. Soc. Ent. Fr. viii. p. 210. Mexico.—L. Koch's genus *Leptoctenus* is characterized by tibiae i. and ii. having four pairs of spines beneath. Clypeus only a little higher than the diameter of the eyes of the first row. Second row of eyes straight. Tarsal claws 2. Scopula absent. Labium half as long as maxilla, the latter much attenuated at base.
1888. *Leptoctenus Tenkatei*, v. Hasselt. ♀, 17.5 mm. Tijdsch. Ent. xxxi. pt. 3, p. 192. Surinam.—Van Hasselt gives the number of tarsal claws as two, but refers the species to the "Lycosidæ."

Genus *Acantheis*, Thor., 1891-2.

1890. *Acanthoctenus*, Keys., Thor. Ann. Mus. Gen. 2, x. (xxx.) Sept. 1890, including:—1, *A. variatus*, Th.; 2, *A.*

dimidiatus, Th.; 3, *A. latus*, Th., 1891-92. Sumatra.—These three species do not possess the calamistrum and cribellum characteristic of *Acanthoctenus spinigerus*, Keys. (type), according to Thorell. Thorell has more recently withdrawn his species and placed them under the name *Acantheis*. In Hist. Nat. Ar. i. p. 229, note, Simon refers them to the subfam. Cteninæ in the fam. Clubionidæ. Of their tarsal claws Thorell says "Unguiculi tarsorum bini graciles, longi, fortissime et aequaliter curvati."

1891-2. *Acantheis*, Thor. Sv. Ak. Handl. xxiv. (2) p. 61, note, is the name given by Thorell to include *Acanthoctenus variatus*, *dimidiatus*, and *latus*, from Sumatra. Not having seen the types, I am unable to judge of their affinities; but, from Thorell's description, one would gather that they belong to the two-clawed "Cteninæ." On p. 61 he says "Ad species illas asiaticas recipiendas, quas ad *Acanthoctenum* retuli et quæ organis illis carent, novum *Cteninarum* genus est creandum, quod *Acantheis* vocari potest."

Genus NYDIA, Thor., 1891-2.

1891-2. *Nydia*, Thor. Rag. Mal. iv. vol. ii. p. 130. Type *N. punctata*, Th., ♀ juv. Sumatra; received from Rev. O. P. Cambridge (*Forbes*).—It appears probable that this species, too, belongs to the Cteninæ. Thorell says that the eyes are in three rows, central row strongly recurved. Ocular quadrangle half as broad again behind as in front and a little longer than its anterior breadth. Labium transverse, truncate at apex. "Tarsi unguiculis binis muniti."

Genus ÆNIGMA, Karsch.

1878. *Ænigma australiana*, Karsch. ♀, 11 mm. Z. ges. Naturw. (3) iii. p. 825. Type of genus. New South Wales.—Karsch says that the eyes are in two rows, the anterior somewhat shorter. He considers it to be near *Dolomedes* and *Ocyale*, adding "aber es fehlt die Afterklaue des Tarsus der Beine." One cannot judge well from the description of its systematic position; but I should expect to find it somewhere near *Zora*.

Table of New-World Genera of the Family Ctenidae*.

Table of Genera.

- A. Tibiæ i. and ii. with 4 or 5 pairs of spines beneath. Protarsi i. and ii. with 3 pairs of spines beneath †.
- I. Tibiæ i. and ii. with 5 pairs of spines beneath; no lateral spines in the female sex (apparently always present in the males). 1—1 dorsal spines on tibiæ iii. and iv. Two lateral spines on patellæ iii. and iv. Lower margin of fang-groove with 5 teeth †.
- a. Second row of eyes straight or more or less procurved *Ctenus* §.
- b. Second row of eyes distinctly recurved. . . . *Phoneutria*, Perty ||.
- II. Tibiæ i. and ii. with 4 pairs of spines beneath; females, as well as males, with two pairs of lateral spines, basal and distal. No dorsal spines on tibiæ iii. and iv. No spines on patellæ iii. and iv. Lower margin of fang-groove with 4 teeth. (Second row of eyes strongly procurved.) *Cupiennius*, Sim.
- Protarsi i. and ii. with 3 pairs of spines beneath, 2 pairs of lateral spines, and 1 small apical spine beneath.
- B. Tibiæ i. and ii. with 7 pairs of very long spines beneath. Protarsi i. and ii. with 7 pairs of long spines beneath *Caloctenus*, Keys.

The affinities of the genus *Thaumasia*, Perty (*T. senilis*), are very doubtful, the figure of the eyes alone offering no sure criterion, while the figure of the spider seems to suggest Lycosid affinities.

* I omit *Leptoctenus*, L. K. (to which genus a single species from Costa Rica has been assigned by Simon), since I do not know the genus at all, while *Microctenus*, Keys., is included under *Ctenus* in Bras. Spinn. 1891, Keys.

† In these calculations are included the small apical spines; care must be taken not to include a lateral spine, nor to exclude a lower spine, slightly inclining to a lateral situation.

‡ The fifth tooth at the basal angle of the fang-groove is in this group very small, and may easily escape notice, but is always, in all specimens which have come before me, unmistakably present, except in a few instances of individual abnormality. In the four-toothed forms there is no trace of this denticule.

§ The type of *Ctenus*, Walck.—*C. dubius*—exhibits, according to his figure (Tabl. Aran. 1805, pl. iii. fig. 22), the straight second row of eyes with a labium longer than broad (fig. 21). His diagnosis of the genus also states that the second row of eyes is straight.

|| There is no evidence that the true *Phoneutria fera* of Perty possessed the characters included under diagnosis A, the only recorded character being that set down at b.

Genus CTENUS (? *Ctenus*, Walck.), provisional.

Diagnosis.—Eyes in three rows, second row straight, by anterior margins, or more or less procurved. Ocular quadrangle longer than broad, as long as broad, or broader than long (i. e. comparing its outside length with the outside breadth of transverse space occupied by posterior central eyes); anterior side equal to or narrower than posterior side of quadrangle. Anterior centrals subequal to or less than posterior centrals. Carapace bluffly rounded behind, in some forms abruptly precipitous. Tibiæ i. and ii. with five pairs of spines beneath; no lateral spines in female (present in male). Protarsi i. and ii. with three pairs of spines beneath, no central apical spine beneath; protarsi iii. and iv. with a single central apical spine beneath. Tarsi i. and ii. and protarsi i. and ii. with scopula beneath. Protarsus iii. with apical scopula, iv. without scopula. Tarsi iii. and iv. with scopula. Tibiæ iii. and iv. with 1—1—1 dorsal spines. Patellæ i. and ii. without spines, iii. and iv. with one spine on each side.

Tarsal claws 2. Claw-tuft present. Patella and tibia i. equal to or much longer than patella and tibia iv. Lower margin of fang-groove with 5 teeth (4 large and 1 small*), upper margin with 3 (1 large and 2 small). Clypeus varying from twice the diameter of anterior centrals to half their diameter.

Examples:—*C. Reidyi*, sp. n., *C. sinuatipes*, sp. n., *C. minor*, sp. n., &c.

Table of Species.

Males.

- I. Carapace not raised and gibbous at base above.
Tibia and tarsus of pedipalp set with thick velvet pad of short soft hair on inner side ... *C. boliviensis*, sp. n.
- II. Carapace distinctly raised and gibbous at base above (except *longipes*), slightly bilobate.
Tibia and tarsus of pedipalp without pad of soft hair on inner side.
 - A. Protarsus iv. almost or quite straight. Ocular quadrangle broader than long. Second row of eyes straight by anterior margins (in *longipes* slightly procurved).
 - i. Length of carapace equal to patella and tibia iii. (Abdomen unicolorous above, black below, with central, pale, longitu-

* This character is not absolutely reliable; in some females of the same species the number varies from 5—3.

- dinal, lanceolate band. Tibial spur of pedipalp longer than broad, directed forwards, obliquely truncate at apex, simple at base.)
- a. Size much larger, 17 mm. Abdomen unicolorous above *C. rectipes*, sp. n.
- b. Size much smaller, 7.5 mm. Abdomen with pale band above. *C. minimus*, sp. n.
- ii. Length of carapace less than patella and tibia iii. (Abdomen with pale central line or scalloped band above.)
- a. Protarsus iv. quite straight.
1. Abdomen with central black band below. Tibial spur of pedipalp short, directed forwards, very broad at apex, as broad as long; lower anterior angle sharp. Central lobe of palpal organs small, as long as broad. Tarsus of pedipalp without spur behind *C. nigrinus*, sp. n.
2. Abdomen unicolorous brown below. Tibial spur of pedipalp short, blunt, rounded at apex, set obliquely to axis of joint. Central palpal lobe large, much longer than broad. Tarsus of pedipalp with spur at base behind *C. longipes*, Keys.
- b. Protarsus iv. slightly sinuous.
1. Size larger, 15.5 mm. Tibial spur twice as long as breadth of base, directed forwards; (apex acute). Apical third of protarsus iv. concave on inner side *C. spiculus*, sp. n.*
2. Size smaller, 10.5 mm. Tibial spur as long as breadth of base, directed forwards, deeply emarginate on lower side; (apex acute) *C. planipes*, sp. n.*

* The characters enclosed in brackets are not intended to alternate with others in the table, but merely to serve as a further clue to the identity of the form.

C. spiculus and *planipes* should more properly, by the form of protarsus iv. and the tibial spur, fall into section B, but the eye-position brings them into section A. All the above species (*curvipes* I cannot answer for, since I have not seen the type) can be readily separated also by the character of the central lobe and marginal spine of the palpal organs. These characters unfortunately do not always fit in with those furnished in the above table.

I am unwilling to tabulate the characters of *teniatus*, *parvus*, and *velox*, for they appear to stand somewhat apart from any of the forms included above. The former may readily be recognized by the comparatively short legs, small size, and quadrate tibia of pedipalp, as long as broad; tibial spur long, curved, blunt, directed outwards and forwards, recurved at apex. *Velox* may be instantly recognized by the short spur beneath coxa iv.; excepting for the eye-formula, it appears to come near *C. planipes*; its posterior protarsi are straight, as also are those of *teniatus*.

B. Protarsus iv. more or less decidedly sinuous.
Ocular quadrangle longer than broad;
second row of eyes procurved.

i. Basal section itself of protarsus iv. curved,
its concavity lying on outer side of seg-
ment, its inner side set with numerous
stout, short, close-lying spines; three,
more separate, more conspicuous, and
set obliquely to axis of segment, situate
towards apical end of basal curve. Apical
section set on inner side beneath with
row of black cuspules, short spines, and
bristles.

a. Size larger, 22 mm. Protarsus iv. much
more strongly curved; basal section
fringed along margin of outer con-
cavity with long silky yellow hairs.
Tibial spur of pedipalp directed for-
wards, as long as width of segment;
lower angle very acute, obliquely
truncate at apex (much longer than
in *rectipes*). Tarsus iv. set at almost
right angles to protarsus on inner
side

C. medius, Keys.

b. Size smaller, 18 mm. Protarsus iv.
much less sinuous, but general cha-
racter the same. Outer margin of
basal concavity not fringed with hairs.
Tibial spur of pedipalp set at right
angles to segment, curved forwards,
trifid (or quadrifid) at apex, with stout
spine at base behind. Tarsus iv. set
in the same straight line with pro-
tarsus

C. serratipes, sp. n.

ii. Basal section of protarsus iv. almost or
quite straight, its central concavity lying
on inner side. Inner margin of basal sec-
tion without row of numerous curved
spines. Apical section smooth beneath
and on inner side.

a. Basal angle of sinuous section set with
stout, curved, chisel-headed spine
lying between two stout long simple
spines. Tibial spur stout, short, set
at right angles to segment, bifid at
apex

C. sinuatifipes, sp. n.

b. Basal angle of sinuous section with
stout chisel-headed spine. Tibial spur
long, slender, curved forwards and
recurved at apex (see Keyserling's
figures)

C. curvipes, Keys.

Females.

1 Tibia and tarsus of pedipalp with thick pad of
short hair on the inner side. Patella and
tibia i. much longer than patella and tibia iv.
(Ocular quadrangle slightly longer than

broad, not or only very slightly narrowed in front. Eyes of ocular quadrangle subequal, anteriors only slightly smaller. Second row of eyes straight by anterior margins. Legs i. equal to or longer than legs iv.)

- A. Tibia and tarsus of pedipalp black, with two narrow pale longitudinal lines in front. Vulva broad, without pair of dark central longitudinal ridges.
- a. Size larger, 40 mm. *C. Reidyi*, sp. n.
 - b. Size smaller, 32-33 mm.
 - 1. Legs i. longer than legs iv. Vulva emarginate anteriorly. *C. Andrewsii*, sp. n.
 - 2. Legs i. equal to legs iv. Vulva not emarginate anteriorly. *C. Pertyi**, nom. nov. (*C. rufibarbis*, Keys.)
- B. Tibia and tarsus of pedipalp unicolorous dark brown, without narrow pale lines in front. Vulva elongate, with pair of parallel, central, longitudinal ridges.
- a. Abdomen with central, dorsal, pale scalloped band (besides lateral pale bands —*boliviensis*).
 - 1. Size much larger, 40 mm. Ventral surface of abdomen without broad black longitudinal band. *C. boliviensis*, sp. n.
 - 2. Size much smaller, 30 mm. Ventral surface of abdomen with broad black longitudinal band. *C. nigriventer*, Keys.
 - b. Abdomen unicolorous above, brown. *C. Keyserlingii*, nom. nov. (*C. ferus*, Keys.)
- II. Tibia and tarsus of pedipalp without pad of short hair on inner side. Patella and tibia i. equal to or only slightly longer than patella and tibia iv. (Legs i. shorter than legs iv.)
- A. Ocular quadrangle slightly longer than broad, scarcely narrower in front. Eyes of quadrangle subequal, anteriors slightly smaller.
- a. Second row of eyes straight by anterior

* There are no really reliable characters other than those drawn from small comparative differences of measurement, difficult and tedious to verify, to be found in these closely allied forms. Really good figures of the *vulva* are alone trustworthy and, as a rule, practicable. In the majority of cases Keyserling's figures suffice for distinguishing the above species.

C. adustus, Keys. (of which the type specimen is before me), is an immature ♀, and one can scarcely regard it as a good species amongst forms which are themselves hardly to be distinguished, save by characters which are manifest only in the adult.

I am at a loss to understand how experienced arachnologists, almost without exception, with countless adult forms to be described, can persuade themselves to base new species, and even new genera, on immature specimens, these very specimens even sometimes being mutilated, worn out, and without legs, as the authors themselves confess.

- margins. Patella and tibia i. longer than patella and tibia iv. Size larger, 27 mm. Vulva with a pair of oval, convex, obliquely convergent tubercles on anterior portion *C. medius*, Keys.
- b. Second row of eyes procurved (straight line touching anterior margins of centrals passing through or above centres of laterals). Patella and tibia i. equal to patella and tibia iv. Size smaller, 20—12 mm.
1. Carapace equal in length to patella and tibia iii. (Vulva without oval tubercles in front, with pair of widely separate oval-elongate furrows on each side in front.) *C. sinuatus*, sp. n.
2. Carapace longer than patella and tibia iii.
- * Size larger, 20.5 mm. Patella and tibia i. slightly longer than patella and tibia iv. (13.7—12.3 mm.) *C. griseus*, Keys.
- ** Size smaller, 12.3 mm. Patella and tibia i. equal to patella and tibia iv. (6.7—6.8 mm.) *C. minusculus*, Keys.
- B. Ocular quadrangle as broad as long or broader than long, distinctly narrower in front. Anterior eyes of quadrangle distinctly smaller.
- a. Patella and tibia i. longer than patella and tibia iv. (9.9—7.5 mm.).
- * Size smaller, 15.3 mm. Legs i. scarcely shorter than legs iv. (26—26.5 mm.) *C. variegatus*, Bertk.
- ** Size larger, 17 mm. Legs i. distinctly shorter than legs iv. (25—27.8 mm.) *C. obscurus*, Keys.
- b. Patella and tibia i. equal to (or almost) patella and tibia iv. (p. t. i. 8.7—p. t. iv. 8.2, *vehemens*; p. t. i. 5.1—p. t. iv. 5.4, *brevipes*), slightly longer, slightly shorter, the rest equal.
1. Second row of eyes procurved, straight line touching anterior margins of centrals passing through centre of laterals. *C. similis*, sp. n.
2. Second row of eyes straight by anterior margins.
- * Clypeus narrower, equal to one diameter of anterior central eyes.
- aa. Size larger, 15.6—17 mm.
- Separable by form of vulva *C. ornatus*, Keys.
C. vehemens, Keys.
- bb. Size smaller, 11—11.4 mm.
- Separable by form of vulva *C. brevipennis*, Keys.
C. adustus, Keys.
C. minor, sp. n.
- ** Clypeus broader, equal to two diameters of anterior central eyes *C. albofasciatus*, sp. n.

Ctenus Reidyi *, sp. n., ♀.

Hab. Forest, Santarem.

Type in coll. Brit. Mus. Nat. Hist. London, 1896.

♀. Length, including mandibles, 40 mm.

Colour.—Carapace orange-mahogany, clothed with short golden-brown hairs. *Abdomen* dull yellow-brown, clothed with golden-brown hairs. *Mandibles* stout, black, densely clothed with bright orange hairs in front. *Coxæ of pedipalp* and *sternum* dark brown, the latter clothed with golden-brown hairs.

Legs. Coxa, trochanter, femur, and tibia orange-brown; protarsus and tarsus dark brown, entirely clothed with golden-brown pubescence.

Pedipalp. Femur and patella orange-brown; tibia and tarsus clothed with a broad band of black pubescence on inner side, a thin line of grey pubescence, and another broader band, black, followed on the outer side with a broad band of grey pubescence, appearing on the upperside as two narrow grey lines.

Structure.—Carapace 16 mm. long, 13.5 broad; abruptly inclined behind, slightly raised towards caput. Central groove distinct, segmental stria just discernible.

Eyes. Laterals situated on a strong tubercle; diameter of anteriors half that of posteriors, situate one diameter from them. Second row straight by anterior margins; the four centrals situated in a quadrangle, slightly longer than broad; posterior centrals very slightly larger.

Mandibles with a shiny tubercle at base on outer side. Fang-groove with 5 teeth on outer margin, 3 on inner margin.

Legs (1. 4) 2. 3. Every segment except the first and last spinose. Tibiæ i. and ii. with a double series of 5, of iii. and iv. of 3, stout spines beneath.

Protarsi i. and ii. with a double series of 3 spines, of iv. with an irregular series beneath.

Tarsi, protarsi i. and ii., and apex of tibia slightly, tarsi and protarsus iii. and tarsi and apex of protarsus iv. clothed with thick scopula. Femora, tibia, and protarsi iii. and iv. clothed beneath with golden-yellow hairs, i. and ii. with pubescence only.

Tarsal claws 2, with claw-tuft on each side; armed on

* In honour of my friend Mr. R. Reidy, whose intimate acquaintance with Brazilian manners and customs and complete mastery of the language smoothed the way for us on many occasions during our expedition.

inner side with 3 small denticules. Spinners 6, anterior pair and posterior pair two-jointed.

Vulva consisting of a broad dark chitinous plate, emarginate before, broadly truncate behind (towards spinners), with two curved yellow side-pieces.

Measurements in millim.—Tot. len. 40, carap. 15.75; legs i. 62.5, ii. 59, iii. 47.5, iv. 62.5; pat. + tib. i. 23, iv. 19, iii. 15.

A single female of this species, the largest of the group met with, was taken by myself in the forest near Santarem. It was started from the palm-leaf thatch of a hut in the forest, in which we had taken refuge from the rain, by my companion Mr. T. Wallace, Jun. Its attitude, crouched down flat upon the surface with legs extended, made it appear, at first sight, to be a gigantic specimen of the ubiquitous *H. venatoria*.

*Otcnus Andrewsii**, sp. n., ♀.

Hab. Santarem and Pará Forest.

Type in coll. Brit. Mus. Nat. Hist. London.

♀. Length 32 mm.

Colour the same as in *Raidyi*, except that the abdomen has a dorsal series of three conspicuous and three smaller and less conspicuous spots on each side of the central line.

Vulva longer in proportion to its breadth. Lateral curved side-pieces absent, their place taken by a black tubercle surmounted by a sharp black spur.

Measurements in millim.—Tot. len. 32, carap. 12.25; legs i. 56, ii. 51.5, iii. 42.5, iv. 56; pat. + tib. i. 20, iv. 16, iii. 12.25.

Two females were taken from the hollow stem of a decayed palm-tree in the forest close to Pará, near the Casa da Oleria. Both of them had a large dull white egg-sac attached to the inner surface of the hollow stem. This form is evidently very closely allied to *Raidyi*, but, seeing that the two specimens from Pará were evidently fully adult, the differences are not merely those due to immaturity, as one would have otherwise suspected. I shall be surprised if fresh material does not confirm the specific difference between the two forms, though it is never safe to prophecy without being in possession of the facts. A third example was taken in the forest near Santarem, wandering about some wooden palings close

* I have much pleasure in naming this form after my friend Mr. T. Andrews, who contributed not a little to the general success of our scientific investigations.

to the Sitio Andirobal. These huge spiders are evidently nocturnal in their habits, the last-mentioned specimen having been disturbed from its hiding-place.

Ctenus boliviensis, sp. n., ♂ ♀.

Hab. Bolivia.

Types in coll. Brit. Mus. Nat. Hist. London, 1896.

♂. Total length, including mandibles, 34 mm., ♀ 40 mm.

♂.—*Colour.* Carapace, legs, and sternum very dark reddish-brown mahogany, clothed with dull yellow-brown pubescence. Abdomen brown, clothed with yellow-brown pubescence. Legs clothed beneath with thick yellowish hair.

♀.—*Colour* similar to that of the male, but darker. Abdomen with broad central scalloped pale band and two or three oblique lateral bands of pale spots extending down the sides, while the integuments have been denuded of pubescence. Pedipalps without pale lines in front. Mandibles clothed at apex with dull orange hairs.

♂.—*Structure.* Carapace, profile almost straight. Eye-formula similar to that of *Reidyi* and *Andrewsi*. Lateral eyes on a distinct tubercle; second row straight by anterior margins. Ocular quadrangle slightly longer than broad, scarcely narrowed in front. Armature of legs similar in both sexes to that of *Reidyi*. Lower margin of fang-groove with 5 teeth, upper with 3. Tarsal claws 2, with 4 curved denticles. Claw-tuft present. Scopula thick on protarsi and tarsi i. and ii., slighter on protarsus iii., and absent on that of iv. Tibia of pedipalp furnished with a very thick scopula, and its apex on outer side armed with a very stout, curved, chisel-headed spur. For palpal organs see Pl. III. fig. iii. a, b, c.

♀.—*Structure* similar to that of the male. The vulva was so damaged that no satisfactory figure can be made of it. It is, however, similar in general character to those of *Keyserlingii* and *nigriventer*.

Measurements in millim.—Tot. len. 41, carap. 16.75; legs i. 65, ii. ?, iii. ?, iv. 64.

These, the largest species of the genus I have met with (except *Reidyi*), were taken by Herr Rolle at Madre de Dios (Bolivia), and were in the collection of the British Museum. They are allied to *Reidyi*, but have not the pale lines on the palps (♀), nor is the hair on the mandible of so bright an orange.

Ctenus Pertyi, nom. nov. (*C. rufibarbis* (Perty), Keys.).

This species, of which I have not seen the type, appears to

be closely allied to *Reidyi* and *Andrewsi*, but evidently quite distinct, if we may judge from Keyserling's figure of the vulva. Cf. notes on *C. rufibarbis* (Perty), Keys., above.

Measurements in millim.—Tot. len. 33·2, carap. 13·2; legs i. 46·6, ii. 41·9, iii. 33·5, iv. 46; pat. + tib. i. 18·5, iv. 16, iii. 12·5.

Otenus Keyserlingii, nom. nov. (*C. ferus* (Perty), Keys.).

The type of this form differs decidedly from both *nigriventer*, Keys., and *boliviensis*, sp. n., in the form of the vulva (see Pl. III. fig. ii. c), though the general character is the same. Cf. notes on *C. ferus* (Perty), Keys., above.

Measurements in millim.—Tot. len. 30, carap. 17·2; legs i. 50·9, ii. 48·3, iii. 37·1, iv. 51·8; pat. + tib. i. 20·5, iv. 18·2, iii. 14·3.

Otenus nigriventer, Keys.

Distinguished from *Keyserlingii* and *boliviensis* by the black ventral surface of the abdomen and a difference in the form of the vulva (Pl. III. fig. ii. d). To finally confirm or refute the apparent distinctions between these three forms one needs many more specimens. It is impossible to make definite assertions based on a single specimen of each form.

Measurements in millim.—Tot. len. 30, carap. 15; legs i. 44·9, ii. 42·2, iii. 34·3, iv. 46·8; pat. + tib. i. 17·9, iv. 16·4, iii. 12·8.

Otenus medius, Keys., ♀.

The figure of the vulva given by Keyserling is quite sufficient to establish the distinction between this form and the others here recorded, even if the type had not been to hand by way of confirmation.

A female and a male (the latter described for the first time below, p. 87) were found in a collection from Theresiopolis, S. Brazil. The female is identical with the type of Keyserling's *medius*.

Measurements in millim.—♀. Tot. len. 22, carap. 12; legs i. 37·5, iv. 42; pat. + tib. i. 13, iv. 12, iii. 10.

Otenus nigritus, sp. n., ♂.

Hab. Forest, Santarem.

Type in coll. Brit. Mus. Nat. Hist. London, 1896.

♂. Total length (including mandibles) 15 mm.

Ann. & Mag. N. Hist. Ser. 6. Vol. xix.

Carapace mahogany-brown, with fine pale central line; clothed with fine yellow-grey pubescence.

Abdomen brown, clothed with black and grey hairs, mixed; with a pale central dorsal line extending from the anterior margin to the spinners; shoulders black, a series of four black spots on each side; ventral surface with a broad wedge-shaped central black band, with two white spots at base and a white margin extending from the stigmatic orifice to the spinners.

Legs mahogany-brown above; sternum and underside of coxæ and femora pale yellow-brown; clothed with fine silky yellow-grey hairs.

Carapace gibbous behind; dorsal profile slightly concave.

Eyes. Laterals on a very slight tubercle; anterior much smaller than posterior, one third their diameter. Centrals forming a quadrangle a little broader than long, posteriors larger. Outer margin of fang-groove armed with 5 teeth, inner with 3.

Legs. Spinous armature similar to others of the group. Tibiæ i. and ii. with five pairs of spines beneath. *Tarsi alone of all four pairs bearing a scopula beneath.* Tarsal claws 2, with four long broad denticules beneath. Claw-tuft present.

Palpus and organs (Pl. III. fig. vii. a).

A single adult male of this spider was taken by myself in the Forest of Santarem, February 1896.

Otenus albofasciatus, sp. n., ♀.

Hab. Forest, Santarem.

Type in coll. Brit. Mus. Nat. Hist. London, 1896.

♀. Total length (including mandibles) 14 mm.

Colour.—*Carapace* dark mahogany-brown, with broad central band of golden-grey pubescence, and a small spot on clypeus above base of each mandible.

Abdomen clothed with black and golden-orange hairs, with a basal, central, dorsal, longitudinal, pale golden-yellow band, extending to the middle of the upperside; shoulders very black. Ventral surface dark brown, with four longitudinal rows of pale spots.

Structure.—*Carapace* gibbous and raised behind, dorsal profile slightly concave. Lateral posterior eyes on a distinct tubercle; lateral anteriors very small, their diameter less than half that of the former and distant from them twice their diameter. Centrals forming a quadrangle a little broader than long; posteriors slightly larger (Pl. III. fig. i. d).

Second row of eyes straight by anterior margins. Lower margin of mandibles with 5 teeth, upper with 3.

Legs. Spinous armature similar to others of the group. Tibiæ i. and ii. with five pairs of spines beneath. Anterior protarsi with three pairs of spines beneath. Protarsi and tarsi i. and ii. clothed beneath with very slight scopula, iii. and iv. tarsi only. Tarsal claws 2, armed beneath with four long broad denticules; claw-tuft present.

Vulva (Pl. III. fig. iv. b).

Measurements in millim.—Tot. len. 14, carap. 6·75; legs i. 20, iv. 25; pat. + tib. i. 7, iv. 7, iii. 5.

Two adult females of this richly coloured species were taken by myself in the Forest of Santarem in Feb. 1896.

Ctenus minor, sp. n., ♀.

Hab. Forest, Santarem.

Type in coll. Brit. Mus. Nat. Hist. London, 1896.

Total length (including mandibles) 11 mm.

Colour. Carapace pale brown, with central band of golden-yellow pubescence. Abdomen dark olive-brown, with numerous scattered groups of pale golden-yellow hairs; with a short basal central band and three or four transverse bars of pale pubescence; sides with three oblique lines of spots of golden-yellow hairs. Ventral surface paler, with numerous longitudinal indistinct lines of pale hairs. Legs pale brown, with numerous isolated short pale hairs and spots of hair.

Structure similar to that of *albofasciatus*. *Vulva* (Pl. III. fig. iv. c).

Measurements in millim.—Tot. len. 11, carap. 5; legs i. 15·5, iv. 19·5; pat. + tib. i. 5·5, iv. 5·5, iii. 4·25.

A single adult female of this small species was taken by myself in the Forest of Santarem, Feb. 1896.

Ctenus similis, sp. n., ♀.

Hab. Forest, Santarem.

Type in coll. Brit. Mus. Nat. Hist. London.

Total length (including mandibles) 12 mm.

This form is almost identical with *C. albofasciatus* except in being smaller, in not having the carapace raised behind, in having the second row of eyes procurved instead of straight, and in possessing a very different form of vulva (Pl. III. fig. iv. a).

Measurements in millim.—Tot. len. 12, carap. 7; legs i. 20·5, iv. 24; pat. + tib. i. 7, iv. 7, iii. 5·25.

A single specimen from the Forest, Santarem, Feb. 1896.

Ctenus planipes, sp. n., ♂.

Hab. Forest, Santarem.

Types in coll. Brit. Mus. Nat. Hist. London.

Total length (including mandibles) 11 mm.

Colour. Carapace very pale yellow-brown. Abdomen darker brown, with central basal pale band extending to the spinners, the last half consisting of indistinct transverse spots; sides paler, spotted with brown. Legs pale olive-brown, clothed with long silky yellow hairs.

Structure. Carapace very much raised and gibbous at base, inclined towards ocular area. Eyes similar to those of *albofasciatus*; second row straight by anterior margins, central anteriors much smaller and forming a narrower transverse row than central posteriors. Ocular quadrangle broader than long. Armature of legs similar to others of the group. Tibiæ i. and ii. with five pairs of spines beneath. Protarsi i. and ii. with three pairs. Lower margin of fang-groove with 5, upper with 3 denticles.

For structure of pedipalp and organs see Pl. III. fig. vi. b. Tibia with a short, curved, sharp black spur, directed forwards along the side of the tarsus, not projecting from the joint.

A single adult male of this species, which belongs to the group including *sinuatifpes*, sp. n., *curvipes*, Keys., and several other forms I have seen, not yet described, was taken in the Forest of Santarem in Feb. 1896.

Ctenus sinuatifpes, sp. n., ♂ ♀.

Hab. Costa Rica.

Types in coll. Brit. Mus. Nat. Hist. London.

Total length (including mandibles), ♂ 20, ♀ 22 mm.

♂.—*Colour.* Carapace mahogany-brown, with a broad diamond-shaped pale patch behind the eyes and a fine central line following it. Abdomen brown, clothed with fine golden-brown pubescence; with a pale, central, longitudinal, dorsal, scalloped band, consisting of five united blotches, clothed with golden-brown pubescence. Underside dull olive-brown. Sternum and legs dull olive-brown, the femora of the latter annulate; clothed with golden-brown pubescence.

♀.—*Colour* similar to that of the male, but much darker.

♂.—*Structure.* Carapace only slightly gibbous at base and slightly concave in profile. Legs similar to others of the genus; scapula slight on apical half of protarsi i. and ii., apex of iii., and none on iv.

Protarsus iv. bent suddenly in the middle in a sinuous form, the basal angle armed with 5 spines and a stout curved chisel-headed spur beneath the joint, its apex directed outwards. Eye-formula similar to others of the genus. Tarsal claws 2, with 4 sinuous denticules; claw-tuft present.

Pedipalp. Tibia with a stout black spur on the outer side at apex; palpal organs (Pl. III. fig. vi. e). The form of the tibial spur is very variable.

♀.—*Structure* similar to that of male. Carapace in profile less concave and gibbous at base. Cephalic area slightly gibbous. Protarsus iv. normal. Vulva (Pl. III. fig. iv. d). Fang-groove with 5 denticules on lower margin, 3 on upper.

Measurements in millim.—♀. Tot. len. 22, carap. 10; legs i. 38, iv. 41.5; pat. + tib. i. 13, iv. 13, iii. 10.

This species, remarkable amongst other allied forms in the male sex for the curious development of the posterior protarsus, which is developed in somewhat the same manner as the protarsus of the first pair of legs in some of the Theraphosidae, was taken at La Palma (Costa Rica) by Mr. J. F. Tristram. There were in the collection two adult males, one adult female, and several immature of the latter sex.

Ctenus rectipes, sp. n., ♂.

Hab. Iguarassu, Brazil.

Type in coll. Brit. Mus. Nat. Hist. London.

Total length 17 mm., carapace 8.5; legs i. 35, iv. 39; carapace equals pat. + tib. iii. in length; pat. + tib. i. longer than pat. + tib. iv.

Colour. Carapace, legs, sternum, and mouth-parts mahogany-brown, clothed with yellow-grey pubescence. Abdomen unicolorous above, clothed with fine rufous-yellow hairs. Ventral area dark sooty brown, with a narrow, central, lanceolate pale band extending from the genital rima almost to the spinners.

Structure. Carapace raised, gibbous, and slightly bilobate behind. Other general characters similar to those of others of the group. Tib. i. and ii. with 5—5 spines beneath, 2 lateral and 2 dorsal. Protarsus iv. straight. Tibia of pedipalp longer than broad, with a short straight apophysis, obliquely truncate at apex, directed forwards from the apex of the joint on outer side, its outer surface striate and its length less than broadest diameter of the joint. Tarsal claws 2.

Eyes. Second row straight by anterior margins; ocular quadrangle as broad as, or slightly broader than, long, a little

narrower in front. Clypeus equal to $1\frac{1}{2}$ diameter of anterior centrals. Apex of inner marginal spine of palpal organs simple, blunt, and stout.

A single male was taken by Mr. Ramage near Iguarassu, Brazil. The species is closely allied to others of the "*curvipes*" group whose posterior *protarsi* are straight. (Pl. III. figs. vi. a and vii. b.)

Ctenus spiculus, sp. n., ♂.

Hab. Colombia.

Type in coll. Brit. Mus. Nat. Hist. London.

Tot. len. 15.5 mm.; carap. 9; pat. + tib. i. 16.75, iv. 16, iii. 9.75.

Colour. Carapace brown, cephalic area with two pale lines on each side, followed by a central line to posterior margin. Legs and abdomen brown (dried specimen).

Structure. General characters as in others of the group. Carapace gibbous at base above. Ocular quadrangle broader than long, narrower in front. Second row straight by anterior margins; clypeus equal to $1\frac{1}{2}$ diameter of anterior centrals. Carapace less than pat. and tib. iii.

Protarsus iv. slightly sinuous, basal concavity (very slight) directed outwards. Apical concavity directed inwards, more noticeable, not spinose except at apex, and from basal end of apical section towards the base of the segment armed with numerous spines. This form of protarsus iv. forms an intermediate link between *rectipes*, *nigritus*, and *longipes*, and *planipes*, *serratipes*, &c.

Tibial spur longer, more slender, twice as long as its basal breadth, apex carinate, recurved; directed straight forwards. Marginal spine of palpal organs stout at apex and simple. Central lobe short, dorsally excavate, not emarginate or bifid in front.

A single specimen of this distinct form taken in Colombia is in the Museum collection. (Pl. III. fig. vii. h.)

Ctenus minimus, sp. n., ♂.

Hab. N. America.

Type in coll. Brit. Mus. Nat. Hist. London.

Tot. len. 7.5 mm., carap. 3.75; legs i. 17, iv. 16.

Structure. Carapace raised and gibbous behind. Tibiæ i. and ii. with five pairs of spines beneath and two lateral spines on each side. General structure otherwise similar to others of the group. Protarsus iv. straight. Pedipalp long, at least two thirds that of carapace, 6 mm. Patella three times longer than broad, tibia four times; tibia incrassate towards apex (as

also the patella), with a short bluntly rounded spur on outer side above at apex, with a second shorter curved spur below and a short, more slender spur lying between, directed towards the base of tarsus. Base of tarsal sheath with small sharp triangular spur on outer side above.

Eyes. Second row straight by anterior margins; ocular quadrangle broader than long, narrower in front, central anteriors a little smaller than posteriors.

Clypeus narrow, equal to one half diameter of anterior centrals.

Colour. Carapace, legs, sternum, and mouth-parts rufous-brown. Abdomen with pale scalloped longitudinal dorsal band. Lateral area streaked with black.

N.B.—These specimens, having been some time in spirit, possibly have not preserved their colouring.

It is not improbable that this species may be the male of *punctulatus*, Hentz, though there are no black longitudinal lines on the carapace, as he points out is the case in his species. I am not aware that these two American species have ever been adequately figured. The specimen described above is one of two males from N. America. (Pl. III. fig. v. 1, 2.)

Ctenus serratipes, sp. n., ♂ ♀.

Hab. Demerara.

Type in coll. Brit. Mus. Nat. Hist. London.

♂. Tot. len. 18 mm., carap. 8.5; pat. + tib. i. 13, iv. 13.5; legs i. 37.3, iv. 39.

♂.—*Colour.* Carapace, legs, and abdomen ferruginous brown (dried specimen).

♀.—*Colour* the same (dried specimen).

♂.—*Structure.* Ocular quadrangle longer than broad; second row of eyes procurved. Details of the structure of the tibial spurs and of protarsus iv. will be found in the table of species.

Central lobe of palpal organs deeply bilobate.

A single male and female in the Museum collection from Demerara. The vulva of the female was not sufficiently preserved to furnish a reliable figure or description. (Pl. III. figs. vi. c and vii. d.)

Ctenus medius, Keys. (♂ new to science).

Hab. Theresiopolis, S. Brazil.

Type in coll. Brit. Mus. Nat. Hist. London.

♂. Tot. len. 22 mm., carap. 11.5; pat. + tib. iii. 13; i. 17, iv. 15.75.

♂.—*Colour.* Carapace, abdomen, and legs unicolorous brown.

Structure. General characters similar to those of others of the group. Ocular quadrangle longer than broad; second row of eyes procurved.

Protarsus iv. very strongly curved, so that the convexity of the basal section lies inwards, while the apical section is straight and the tarsus is set on obliquely or almost at right angles to the protarsus, its apex directed inwards. A detailed description of this portion of the structure and of the tibial spur is given in the table of specific characters.

Palpal organs. Marginal spine trifid at apex; central lobe small, broad, rounded at apex, simple.

For notes on *C. medius*, Keys., ♀, see p. 81.

A single specimen of the male and another of the female of this extraordinary spider were found in a collection from Theresiopolis, S. Brazil. The female is identical with *C. medius*, Keys., of which the type is now before me, easily recognizable by the pair of oval boss-like prominences lying obliquely and convergent at the anterior margin of the vulva. These types are from Rio Janeiro. It is interesting to find that the male of this very ordinary looking female should be so extraordinary in appearance, owing to its excentrically developed posterior legs.

PART II.—(a) *Genera of the Old and New Worlds which have been assigned by various authors to the Families Ctenidæ and Lycosidæ, containing Forms possessing three tarsal claws, with Notes on the Type Species.*

1872. *Senoculus*, Tacz. Hor. Soc. Ent. Ross. ix. p. 108, t. iii. fig. 4. Type *S. maronicus*, Tacz.—St. Laurent de Maroni.

1876. *Nilus*, Cambr. Spid. Palest. Egypt, p. 596, pl. lix. fig. 13. Type *N. curtus*, Cambr.—Alexandria.

1878. *Pycnostenus*, L. Koch, Arach. Austr. ii. p. 996, pl. lxxxvii. fig. 2. Type *P. robustus*, L. K.—Sydney.

1873. *Labdacus*, Cambr. Proc. Zool. Soc. p. 118. Type *L. monastoides*, Cambr., ♀.—Rio Grande, Brazil.

1878. *Cydoctenus*, L. Koch, Arach. Austr. ii. p. 988, t. lxxxvi. 3. Type *C. flaviceps*, L. K., ♀.—New Holland.

1880. *Stenoctenus*, Keys. Verh. z.-b. Ges. Wien, xxix. p. 340. Type *S. gracilis*, Keys., ♀.—Peru.

1880. *Platyctenus*, Keys. Verh. z.-b. Ges. Wien, xxix. p. 338, note.

1880. *Ancyclometes*, Bertk. Mém. Cour. Acad. Belg. xliii. p. 114. Type *A. vulpes*, Bertk., ♀.—Barbacena.

1884. *Titurius*, Sim. Ann. Mus. Gen. xx. p. 328. Type *T. fimbriatus* (Walck.), ♀.—Cape of Good Hope.
1885. *Thalassius*, Sim. Bull. Soc. Zool. Fr. p. 18. For *Titurius*, nom. procc.
- *1888. *Vulsor*, Sim. Ann. Soc. Ent. Fr. viii. p. 233. Type *V. bidens*, Sim., ♀.—Island Mayotte, Madagascar.
- *1888. *Viridasius*, Sim. Ann. Soc. Ent. Fr. viii. p. 233. Type *V. pulchripes*, Sim., ♂ ♀.—Island Nossi-Bé, Madagascar.
1891. *Dolopæus*, Thor. Kongl. Sv. Vet.-Akad. Handl. xxiv. (2) p. 60. Type *D. cinctus*, Thor., ♀.—Island Kamorta, Nicobar, Bay of Bengal.

The type of *Pycnoctenus*, L. K., will be the single species described at the time of founding the genus, *P. robustus*, L. K. For the same reason *Nilus curtus*, Cambr., remains as the type of *Nilus*, Cambr. *L. monastoides*, Ch., was the single species originally assigned to *Labdacus*, Cambr., while *Cycloctenus flaviceps*, L. K., is, for the same reason, the type of *Cycloctenus*, L. Koch. *Stenoctenus gracilis*, Keys., is also on this account the type of *Stenoctenus*, Keys. *A. vulpes*, Bertk., for the same reason, is the type of *Ancyclometes*, Bertk.

M. Simon has selected *T. fimbriatus* (Walck.), sub *Ctenus*, as the type of (*Titurius*) *Thalassius*, Sim. *V. bidens*, Sim., and *V. pulchripes*, Sim., remain with an undisputed right to be regarded as the types of *Vulsor*, Sim., and *Viridasius*, Sim., respectively. *Dolopæus cinctus*, Thor., is alone also as the type of *Dolopæus*, Thor. *P. maronicus* (Tacz.), sub *Senoculus*, is the type of *Platyctenus*, Keys., a name substituted, on the ground of inappropriateness, for *Senoculus*, Tacz.

Note.—Genus *DOLOMEDES*, Latr., 1804.

1833. *Dolomedes concolor*, Perty. ♀. Del. Anim. Bras. iii. p. 197, pl. xxxix. fig. 4. Sebastiaoopolis, Brazil.—The form of the eyes is "Ctenoid," though it is quite likely, for all the evidence to the contrary, that it belongs near my *Lycoctenus*. No mention is made of the number of tarsal claws. See sub *Ctenus unicolor*, Walck., above, p. 61.

Genus *SENOCLUS*, Tacz., 1872.

1872. *Senoculus*, Tacz.—A name given to a spider with a Ctenoid eye-formula, supposed by Karsch to be six-eyed, whereas in reality the lateral anterior eyes are present, though very small and inconspicuous (*S. maronicus*, Tacz.). Keyserling, in consideration of the resemblance of his

* I cannot gather from Simon's description to which group these two genera belong.

Stenoctenus gracilis to *Senoculus*, and convinced that it was an eight-eyed form, gave it the name *Platyctenus*, on the grounds that *Senoculus* was inappropriate. The latter name having been obviously given under a misapprehension, it seems reasonable to modify in such cases the strict letter of the laws of nomenclature. But if one begins to discard names on the ground of inappropriateness, where is the process to stop? I therefore would regard *Platyctenus* as a synonym of *Senoculus*.

1872. *Senoculus maronicus*, Tacz. ♀, 6 mm. Hor. Soc. Ent. Ross. ix. p. 108, t. iii. fig. 4. Type of genus, only species described. St. Laurent de Maroni.

1879. *Senoculus rubromaculatus*, Keys. ♀, 8.5 mm. Verh. z.-b. Ges. Wien, p. 339, pl. iv. fig. 30. Peru.

Genus LARDACUS, Cambr., 1873.

1873. *Labdacus monastoides*, Cambr. ♀, 9.5 mm. Proc. Zool. Soc. Lond. p. 118. Type in coll. O. P. C. Rio Grande, Brazil.

1880. *L. plumosus*, Sim. ♀, carap. 3.6 mm. Bull. Soc. Zool. Fr. p. 154. Pará, Brazil.

1880. *L. purpureus*, Sim. ♀, 8.5 mm. Bull. Soc. Zool. Fr. p. 155. Panama.

1880. *L. parallelus*, Sim. ♀, 8.6 mm. Bull. Soc. Zool. Fr. p. 156. Tefé, Upper Amazons, Brazil.

1880. *L. ruficapillus*, Sim. ♂ ♀, 9.5 mm. Bull. Soc. Zool. Fr. p. 154. Pará, Brazil.

1880. *L. iricolor*, Sim. ♂ ♀, 12.5 mm. Bull. Soc. Zool. Fr. p. 153. Tefé, Upper Amazons, Brazil.

Table of Species (after Simon).

A. Carapace and abdomen clothed with plumose hairs.

1. Carapace with striæ strongly marked *L. plumosus*, Sim.
2. Carapace with striæ scarcely noticeable *L. iricolor*, Sim.

B. Carapace and abdomen clothed with simple hairs.

- i. Legs short. Tibiæ i. and ii. with 4—4 (or 5—5) long spines beneath.
 - a. Posterior eyes very large. Centrals a little less than their diameter apart, scarcely $1\frac{1}{2}$ diameter from laterals *L. ruficapillus*, Sim.
 - b. Posterior eyes moderate in size. Centrals

further apart, at least over one diameter apart, at least two diameters from laterals.

1. Tibiæ i. and ii. with 5—5 spines beneath. Protarsi i. and ii. with 5—5 (or 5—6) spines beneath. Central posterior eyes two diameters from laterals. Size smaller, carapace 3 mm. *L. purpureus*, Sim.
- 1a. The number of spines beneath tibiæ i. and ii. not mentioned in the description, but are 5 in the figures *L. monastoides*, Ch.
2. Tibiæ i. and ii. with 4—4 spines beneath. Protarsi i. and ii. with 3—3 spines beneath. Central posteriors 3 diameters from laterals. Size larger, carapace 5.5 mm. *L. albidus*, sp. n.

Labdacus albidus, sp. n., ♀.

Hab. Rio de Janeiro.

Type in coll. Brit. Mus. Nat. Hist. London.

Carapace 5.5 mm., abd. 10.

Colour. Carapace, legs, and abdomen dull yellow-red, clothed with short pure white pubescence. Legs furnished with short fine black spines, their margins fringed with long curving silky white hairs.

Structure. Carapace with striæ distinct; anterior ocular area (from anterior margin of posterior centrals to clypeus) horizontal. Central anterior eyes $1\frac{1}{2}$ diameter apart, very small. Clypeus narrow, $1\frac{1}{2}$ diameter of anterior centrals. Ocular quadrangle longer than broad, narrower in front. Central posteriors $1\frac{1}{2}$ diameter apart, 3 diameters from laterals. Lateral anteriors very small, close in front of posterior laterals.

Legs. Tibiæ i. and ii. with 4—4 spines beneath and 2 lateral spines; protarsi i. and ii. with 3—3 spines beneath and 2 or 3 laterals.

Tarsal claws 3.

The description of this fine species, the largest of the genus hitherto discovered, is drawn from a dried specimen in the Museum collection. It is closely allied to *purpureus*, Sim., but differs in the number of subtibial spines and the position of the eyes. I give a table of species according to the characters furnished by M. Simon, including *albidus* and *monastoides*, for the benefit of those who may not have Simon's paper at hand.

Genus NILUS, Cambr., 1876.

1876. *Nilus*, Cambr.—The eye-formula and three tarsal claws would seem to suggest *Thalassius*, Sim.

Genus PYCNOCTENUS, L. K., 1878.

1878. *Pycnoctenus*, L. K.—I have not yet seen a form from the New World which I could assign to this genus.

Genus CYCLOCTENUS, L. K., 1878.

1878. *Cycloctenus*, L. K.—No form which I have met with yet from the New World would seem to belong to this genus.

Genus STENOCTENUS, Keys., 1880.

1880. *Stenoctenus gracilis*, Keys. ♀, 8 mm. Verhand. z.-b. Ges. Wien, p. 341, t. iv. fig. 29. Type in coll. Warsaw Museum. Aimable Maria, Peru.—I have not seen the type of this species, also the type of the genus; but of this and *Senoculus* Keyserling says (p. 337):—"Diese und die folgende Gattung gehören in der mit drei Klauen am Ende der Tarsen," &c.

Another species which was found in Keyserling's collection under the name *S. pallidus*, from Brazil, I describe below, since I can find no description of it.

Keyserling placed *Stenoctenus* and *Senoculus* under the Ctenoidæ.

Stenoctenus pallidus is closely related to, if not identical with, "*Labdacus*," Cambr., a three-clawed form with Ctenoid eye-formula.

In 1880 (Bull. Soc. Zool. Fr. v. p. 152) M. Simon says of *Labdacus*:—"Il tient en effet de près aux *Ctenus*, aux *Oxyopes*, aux *Podophthalma*, aux *Triclarina*, C. K."—"pour nous il se rattache cependant à la famille des Ctenidæ." This must have been before M. Simon decided upon regarding the tarsal claws as of more importance than resemblances in the eye-formula.

The type of *Labdacus*, Cb., and *Stenoctenus pallidus* certainly have no connexion with the true Cteninæ with two claws, save a certain resemblance in the eye-position.

Stenoctenus pallidus, sp. n.

Type in coll. Brit. Mus. Nat. Hist. London.

Rio de Janeiro, São Antonio.

♂.—*Colour*. Carapace dull orange, suffused on the margins with dusky black. Mandibles dull orange. Sternum, maxillæ, and legs pale straw-yellow. Abdomen pale yellow, its lateral margins reticulated with black streaks. Dorsal

area with several smaller black spots and with a larger single black arrow-head mark just behind the centre. Eyes set on six large black spots.

Structure. Carapace longer than broad, segmental grooves well marked. Ocular area of carapace almost *flat*, not rounded nor vertical in front, but only slightly depressed towards clypeus, whose width is less than half a diameter of anterior centrals. Eyes very small, set on black tubercles. Posterior row recurved, occupying the total width of caput; eyes subequal, centrals 2 diameters apart, 4 from lateral posteriors. Lateral anteriors very minute, set just in front of the lateral tubercle, but not *on* it. Anterior centrals smaller than posterior centrals, $\frac{3}{4}$ of a diameter apart, 3 from central posteriors. Ocular quadrangle longer than broad, narrower in front.

Legs very long, 1, 4, 2, 3 (i. is twice as long as total length of body, iii. about $1\frac{1}{2}$ total length), very spinose, many, however, being rubbed off the femora. Tibiæ i. and ii. with 9–10 spines on either side underneath, and 2 or 3 dorsal. Protarsi i. and ii. with 8–9 spines on either side beneath. Tibia and protarsi iii. and iv. with several pairs of long spines beneath. Tarsi without *scopula*, furnished beneath with short stiff bristles.

Tarsal claws 3, the upper with 9–10 long denticles, the under without any.

Sternum longer than broad; coxæ iv. contiguous.

Labium three times longer than broad, $\frac{3}{4}$ the length of maxillæ, parallel-sided, apex truncate, set with converging bristles. Maxillæ four times longer than broad, straight, parallel, parallel-sided, rounded at apex.

Mandibles straight, slightly concave on inner side in front, with several converging bristles. Lower margin of fang-groove with three teeth, upper with two. Spinners situated at the extreme apex of abdomen. Tarsus of pedipalp furnished with numerous stout spines (Pl. IV. fig. v. a, b).

A single adult male in coll. Keyserling, named *pallidus*, from Rio Janeiro.

1880. *Platyctenus*, Keys. Verh. z.-b. Wien, xxix. p. 338, note.—A name suggested by Keyserling instead of *Senoculus*. The spiders included in this genus and *Stenoctenus* probably do not belong to the Clubionidæ, subfam. Cteninæ, at all.

1880. *Ancylometes*, Bertk.—In the absence of the type or any description made from a comparative point of view I hesitate to suggest the affinities of the genus.

Genus THALASSIUS, Sim., 1885.

1884. *Titurius*, Sim., = 1885. *Thalassius*, Sim.—Forms from the Cape are before me which would seem without doubt to belong to this genus. It is very distinct from *Lycootenus*. Of the type of the genus, *T. fimbriatus* (Walck.), M. Simon kindly tells me (Sept. 5, 1896):—"Je pense que le type de *Titurius* (*Ctenus*) *fimbriatus*, Walck., n'existe plus."

VULSOR, Sim., 1888.

1888. *Vulsor bidens*, Sim. ♀, 21 mm. Ann. Soc. Ent. Fr. viii. p. 233. Mayotte, Madagascar.—This species and the next have an eye-formula very similar to that of *Thalassius* (*Titurius*), Sim.—at least, so one would gather from the description,—the lateral anteriors being equidistant between the central anteriors and the central posteriors. Tibiæ i. and ii. with 3—3 spines beneath and 2 lateral spines. Ocular quadrangle as broad as long, anterior row narrower than the space occupied by central posteriors. Clypeus one half broader than diameter of central anterior eyes. Lower margin of fang-groove with 2 teeth. Simon places this and the next genus amongst the Cteninæ, but whether as a two-clawed form or not one cannot say, for it is not obvious from the description.

VIRIDASIUS, Sim., 1888.

1888. *Viridasius pulchripes*, Sim. 21 mm. Ann. Soc. Ent. Fr. viii. p. 233. Nossi-Bé.—The remarks made under *Vulsor* above apply also to this form. It is generically distinct (sec. Simon) from *Vulsor* by the higher clypeus, twice as high as the diameter of anterior central eyes, and by the 4—4 spines beneath tibiæ i. and ii., instead of 3—3 as in *Vulsor*.

Genus THAUMASIA, Perty, 1833.

1833. *Thaumasia senilis*, Perty. ♂. Del. Anim. Art. iii. p. 192, t. xxxviii. 5. Brazil, Piauiensi.—It is very doubtful whether this species belongs to the Cteninæ or not. The eyes would suggest that it does, but the general character that it does not. It seems highly probable that it belongs to one of the Lycosid groups.

Genus DOLOPCEUS, Thor.

1891. *Dolopceus*, Thor.—I cannot as yet speak with any certainty of the affinities of this genus, except that it has three tarsal claws and a "Ctenoid" eye-formula.

(b) *Characters of a new Genus and Descriptions of new Species from the New World.*

Genus LYCOCTENUS, nov. *

Type *L. brunneus*, sp. n.

Lower Amazons.

Diagnosis.—Eye-formula "Ctenoid," second row procurved. Lateral anteriors midway between central and lateral posteriors. Ocular quadrangle a little longer than broad, scarcely narrower in front than behind; all four eyes subequal. Clypeus equal to $2\frac{1}{2}$ diameters of anterior centrals.

Lower margin of fang-groove with 4 stout teeth, no. 3 sometimes small (*♂ Hewitsoni* has 3 only), upper with 1 large and 2 small.

Tibiæ i. and ii. with 4 pairs of short spines beneath. No lateral or dorsal spines in the female (male with 3 lateral and 3 dorsal).

Protarsi i. and ii. with 3 pairs of spines beneath and a single short stout spur at apex beneath. Protarsi iii. and iv. with two apical spines beneath.

Posterior tarsi iii. and iv. with a double series of 3–6 short spines beneath on each side.

* I hesitate to determine the systematic position of this genus until much more material has come before me. It is undoubtedly very nearly allied to *Thalassius* (*Titurius*), Simon; but the latter (sec. Simon) has three teeth on the lower margin of the fang-groove, one of the characters by which *Thalassius* is distinguished (sec. Simon) from *Dolomedes*. Specimens very probably belonging to *Thalassius*, Simon, which have come before me from South Africa, are certainly not congeneric with my *Lycotenus*. *Vulsor* and *Viridarius* possess 2 teeth only on the fang-margin. Of *Dolopceus* Thorell says (1895, Spid. Burmah) "non a *Thalassius* differt"; so that it certainly differs from *Lycotenus*. Neither is *Lycotenus* congeneric with *Pycnotenus* and *Cycloctenus*, L. K., since the posterior eyes of the ocular quadrangle are much larger than the anteriors in the latter genera, while in *Lycotenus* both posterior and anterior eyes are subequal. I would not like to be too sure about its distinctness from *Ancylometes*, Bertk., for I do not quite grasp the characters of the latter. M. Simon says with reference to this genus, comparing it with *Dolomedes*:—"la marge inférieure des chélicères offre constamment quatre dents (*Dolomedes*), tandis que chez les *Thalassius*, de même que chez les *Ancylometes*, elle n'en présente que trois." Bertkau says of his own genus, "unterer Klauenfalsrand mit 4, oberer mit 2 Zähnen," so that I hesitate to speak at all positively concerning the latter genus.

A thick undivided scopula beneath tarsi and protarsi i. and ii. Scopula beneath apex of protarsus iii., none beneath iv. Scopula beneath tarsi iii. and iv. divided longitudinally by a broad band of setæ.

Legs 4, 1, 2, 3.

Tarsal claws 3. Claw-tuft absent.

Labium scarcely longer than broad, narrowed at base, rounded at apex.

Maxilla straight, rounded externally, obliquely truncate on inner apex, much narrowed at base.

Maxillæ set in a transverse quadrangle, broader than long, posterior pair wider apart than anterior at base, more slender and slightly longer; both pairs cylindrical, with small apical joint. Central pair shorter, and broadly truncate at apex.

Carapace abruptly but obliquely precipitous behind.

Patella and tibia i. equal to or less than patella and tibia iv.

Table of Species.

Males.

- A. Carapace dark fulvous brown, with broad lateral margin white.
1. Abdomen unicolorous brown above. Carapace not shorter than tib. i. (or iv.).
 - a. Size larger, 22 mm. Pat. and tib. i. longer than pat. and tib. iv. Palpal "unca" plain in front *L. demerarensis*, sp. n.
 - b. Size smaller, 18 mm. Pat. and tib. i. equal to pat. and tib. iv. Palpal "unca" with sharp prominent angle in centre of frontal margin *L. colombianus*, sp. n.
 2. Abdomen with two small white spots above the black shoulder-spot; a pair of small central dorsal white spots and a pair of white spots towards the apex. Carapace much shorter than tib. i. (or iv.).
 - a. Size much larger, 30 mm. Pat. and tib. i. longer than pat. and tib. iv. Palpal "unca" stout at apex and abruptly hooked; dorsal angle much more prominent *L. gigas*, sp. n.
 - b. Size much smaller, 20 mm. Pat. and tib. i. shorter than pat. and tib. iv. Palpal "unca" more slender at apex and not abruptly hooked; dorsal angle less prominent *L. brunneus*, sp. n.
- B. Carapace pale straw-yellow (or dull orange), with a broad lateral brown band on each side of a broad central pale band *L. Hewitsoni*, sp. n.

Females.

- A. Carapace dark fulvous brown, with broad lateral margin white.
1. Size larger, 35 mm. Central tongue of vulva with median groove, rounded anteriorly, obtusely pointed behind; in profile not abruptly inclined posteriorly *L. brunneus*, sp. n.
 2. Size smaller, 27 mm. Central tongue of vulva with median carina, squarely truncate anteriorly, sharply pointed behind; in profile abruptly inclined posteriorly *L. bogotensis*, Keys.
- B. Carapace pale straw-yellow (or dull orange), with a broad lateral brown band on each side of a broad central pale band. ♀ juv. *L. Hewitsoni*, sp. n.

Lycotenus brunneus, sp. n., ♂ ♀.

Hab. Forest, Santarem.

Type in coll. Brit. Mus. Nat. Hist. London.

♀. Length (including mandibles) 32 mm., ♂ 20 mm.

Colour. Carapace, mandibles, pedipalps, legs, and sternum dull red-brown, clothed with short brown pubescence. Abdomen brown, clothed with short brown pubescence, with a double dorsal series of two distinct small pale spots, and two much larger ones just above the spinners. Anterior shoulders of abdomen black. Sides marked with a few pale spots. Underside with a broad, central, pale wedge-shaped band, indistinct; no stigmata near vulva. Legs mottled very indistinctly with dark brown.

♂. Similar, except carapace with broad grey band on each side.

Carapace. Central stria distinct. Cephalic area not raised at all; profile line of thoracic and cephalic regions horizontal; abruptly and precipitously inclined at the base.

Eyes. Laterals not on a distinct tubercle; posteriors prominent, diameter twice that of anteriors, the latter distant more than one diameter from the former. Four centrals in a quadrangle a little longer than broad. Posteriors slightly larger.

Legs. Femora i., ii., iii., and iv. spinose above. Tibiæ i. and ii. with four pairs. Protarsi i. and ii. with three pairs of spines beneath, and a single apical central spine beneath; iii. and iv. with two apical spines beneath. Tibiæ and protarsi iii. and iv. with numerous spines above and below.

Tarsal claws 3, superiors armed with 5 or 6 long broad denticules. No claw-tuft.

A thick scopula beneath protarsi and tarsi i. and ii., beneath tarsus and apical half of protarsus iii., and beneath tarsus

alone of iv. Tarsi iii. and iv. with a double series of 6 small spines beneath, on either side of central longitudinal band of setæ.

Vulva consisting of a broad, central, wedge-shaped chitinous piece, convex in front, with three longitudinal indentations or grooves, the central one the longest, having on each side a broad, semicircular, convex band of chitin. Palpal organs of male with a central hook-like apophysis (the "unca"), the hook itself long and slightly curved. Tibia furnished with two dark apophyses at apex, one beneath the other on outer side (see figures). Fang-groove of mandibles with four teeth on lower side, three towards base on upperside.

Measurements in millim.—♂. Tot. len. 20, carap. 10; legs i. 53, iv. 56; pat. + tib. i. 15·5, iv. 16·75; tib. i. 11, iv. 12.

♀. Tot. len. 35, carap. 14; legs i. 50, iv. 56; pat. + tib. i. 17, iv. 17; tib. i. 10·5, iv. 11.

Five females and one male of this fine species were taken by myself in the forest near Santarem. They seem to lead a vagabond life, appearing sometimes in the daytime, sometimes at night, but are probably chiefly nocturnal in their habits. The male was taken after dark, with the aid of a lantern, crossing a path in the forest, and one of the females ascending a bank, having been disturbed by the scrimmage made in an effort to secure a fine scorpion. (Pl. IV. figs. i. a, c 2, d, and ii. a, c.)

Lycoctenus bogotensis (Keys.), ♀. Verh. z.-b. Ges. Wien, 1877, p. 684.

Tot. len. 27 mm., carap. 12·7; legs i. 38·5, iv. 46; pat. + tib. i. 15, iv. 15·4; tib. i. 9·2, iv. 10 (sec. Keyserling).

This species, of which the types are before me, is readily distinguishable by the form of the vulva from *brunneus*, though at first sight they appear identical. The central tongue of the vulva has a high carina in the centre, abruptly lowered posteriorly, seen in profile. This central tongue in *brunneus* has a central channel between two low carinæ, which sink gradually behind. In *bogotensis* the central tongue is squarely truncate and broader anteriorly, converging to a sharp point posteriorly; in *brunneus* it is narrower and rounded anteriorly, bluffly rounded behind, though attenuate (Pl. IV. fig. ii. b, d).

Lycoctenus gigas, sp. n., ♂.

Hab. Uncertain, probably Upper Amazona.

Type in coll. Brit. Mus. Nat. Hist. London.

Tot. len. 30 mm., carap. 13.5; legs i. 75, iv. 76; pat. + tib. i. 23.5, iv. 22.

This huge form, the full expanse of whose legs extends over 5½ inches (149 mm.), while that of *brunneus* is only 4 inches (118 mm.), is identical with the latter in general characters, but presents decided differences on close comparison with it, irrespective of absolute size. Pat. and tib. i. are in *gigas* longer than the same segments in iv., while in *brunneus* the first two are shorter than those of iv.

The palpal "unca," though longer and somewhat more slender, is much stouter and more abruptly hooked at its extremity, while the dorsal angle is more prominent and different in form (Pl. IV. fig. i. c, 1).

A single specimen in the Museum collection from Brazil, probably from the Upper Amazons.

Lycoctenus demerarensis, sp. n., ♂

Hab. Demerara.

Type in coll. Brit. Mus. Nat. Hist. London.

Tot. len. 22 mm., carap. 11; legs i. 54, iv. 57; pat. + tib. i. 17, iv. 16; tib. i. 10.75, iv. 11.25.

Abdomen unicolorous above, dull russet below. A form closely allied to *colombianus*, which may ultimately prove to be identical with it. Pat. and tib. iv. are unequal in the present form, equal in *colombianus*, while the palpal "unca" presents differences sufficient, in consideration of the difference of locality, to warrant the formation of a distinct subspecies for both forms, until further material enables one to decide more positively on the point.

It can readily be distinguished from *gigas* and *brunneus* by the absence of spots on the abdomen and from the fact that the carapace equals tibia iv. in length. The "unca" of the palpal organs is, moreover, more slender and does not present so decided and prominent a dorsal angle as in these two latter forms (Pl. IV. fig. i. c, 3).

A single male from Demerara, taken by Mr. W. L. Selater.

Lycoctenus colombianus, sp. n., ♂.

Hab. Colombia, S. America.

Type in coll. Brit. Mus. Nat. Hist. London.

Tot. len. 18 mm., carap. 9.5; legs i. 39, iv. 46; pat. + tib. i. 13.5, iv. 13.5; tib. i. 9, iv. 9.5.

Abdomen unicolorous above, ferruginous below. This form resembles *demerarensis* in general characters, but differs

from it in the form of the palpal "unca," its smaller size, and in the relative lengths of pat. and tib. i. and iv. From *gigas* and *brunneus* it may be known by the concolorous abdomen (Pl. IV. fig. i. 4).

A single dried specimen of the male in the Museum collection from Colombia, South America.

Lycotenus Hewitsoni, sp. n.*, ♂ ♀.

Hab. Largo, near Santarem.

Types in coll. Brit. Mus. Nat. Hist. London.

♀ (immature). Length (including mandibles) 25 mm., ♂ 20 mm.

Colour.—♀. The whole spider entirely dull yellow-brown, carapace and abdomen towards apex darker; the former exhibits an indistinct broad central and marginal pale bands. Legs variegated with numerous spots and lines of white pubescence.

♂. Similar to the female; carapace paler, with two dark bands between the three pale bands much more distinctly marked. Abdomen with shoulders darker and two dark central, dorsal, parallel lines on the basal half, continued as a single line to the spinners. Legs pale yellow; tibia, protarsi, and tarsi sooty, clothed with white and grey pubescence, especially conspicuous on the protarsi.

Ocular area and clypeus spotted with white pubescence. Mandibles with a conspicuous basal spot of white on upper-side.

Carapace with fine central stria, gibbous posteriorly, and abruptly inclined to the pedicle. Dorsal profile slightly concave. Eyes as in "*brunneus*," laterals not on tubercle. Fang-groove with 3 denticles on both margins. Armature of legs similar to that of "*brunneus*." Tarsal claws 3; superiors with 6 long broad denticles beneath, graduated towards base. No claw-tuft.

♀ juv. Similar to the male, but margins of fang-groove with four denticles on each.

Measurements in millim.—Tot. len. 18, carap. 9.5; tib. i. 9.5, iv. 9.5; pat. + tib. i. 12.5, iv. 12.5; legs i. 38, iv. 43.

Very abundant on grass and rushes in the Largo at the mouth of the Tapajos, opposite Santarem. The females were unfortunately all immature, though I had the luck to secure one adult male. The spiders rested on the grass with legs

* In memory of a delightful expedition in company with Mr. Hewitson to the haunts of the "*Victoria regia*," when numerous arachnological treasures were added to our collection.

stretched out before and behind along the stem, being very difficult to see owing to the exact similarity of their colour to the pale yellow withered grass-blades. When alarmed they would run with ease and great rapidity on the surface of the water, diving below or running down the grass-stems beneath the surface if hard pressed. The Dolomedine habits and general structure of this species and another much larger form, of which I was unable to get adult specimens, and therefore hesitate to describe, are very noteworthy. (Pl. IV. fig. i. b.)

PART III.—Cribellate “Ctenoid” Forms referred by Simon to Fam. Zoropsidæ, with two tarsal claws; Notes and Descriptions of new Species from the New World.

Family Zoropsidæ, Simon*.

Subfam. ACANTHOCTENINÆ, Sim.

Genus ACANTHOCTENUS, Keys., 1877.

Diagnosis.—Eye-formula “Ctenoid.” Ocular quadrangle scarcely longer than broad; anterior side narrower; anterior centrals smaller than posterior centrals; second row procurved. Clypeus as high as twice the diameter of anterior centrals†. Tibiæ i. and ii. with 7–9 pairs of very long spines beneath and 3–4 spines on each side. Protarsi i. and ii. with five pairs of long spines beneath; no central apical spine beneath. Patella and tibia i. much longer than iv. Legs (1, 4)—2, 3. Tarsal claws 2. Calamistrum and cribellum present. Lower margin of fang-groove with 3 teeth, upper with 2.

This genus was formed for the reception of two Cteniform species, *A. spinipes*, Keys., from Bogota, and *A. spinigerus*, Keys., from Cordova, Mexico, in 1877.

M. Simon has pointed out (Hist. Nat. Ar. i. p. 229) that these spiders having the calamistrum and cribellum belong more properly to his family Zoropsidæ, under the subfamily Acanthocteninae. He also says that the species referred to this genus by Thorell (Ann. Mus. Gen. 1890) &c.—*A. variatus*, *dimidiatus*, and *lætus*—belong to the Cteninae.

The type of this genus has been selected by M. Simon,

* This classification is adopted provisionally.

† M. Simon says (Hist. Nat. Ar. i. p. 229):—“Clypeus oculis anticis non multo latior.” If the comparison is with the diameter of the eyes it is incorrect, but if with the transverse space occupied by the eyes it is a pity it is not clearly so stated. Fig. 178, p. 227, is, however, correct in this respect.

namely *A. spiniger*, Keys.; this, however, is not the name given by Keyserling, which is *spinigerus*.

I have been able to add a fine species to the genus in addition to the two, *spinigerus* and *spinipes*, described by Keyserling, of which the types are now before me, and another has come to hand from the collection of Mr. Ridley, in the possession of the Natural History Museum, South Kensington, taken near Pernambuco, to which I have given the name *Ridleyi*.

Table of Species.

Males.

- a. Size much larger, 17 mm. Tibia of pedipalp much produced beneath, on outer side at apex; forming a dilatation whose apex is furnished with a short, sharp, black hook. Apex of bulb bearing a fine, curving, spiraloid spine, springing from a membranous tissue *A. Marshii*, sp. n.
- b. Size much smaller, 12.5 mm. Tibia of pedipalp not so much produced; outer side slightly dilate at apex and terminating in a short, broad, chitinous spur. Apex of bulb bearing no spiraloid spine *A. spinigerus*, Keys.

Females.

- a. Size much larger, 20 mm. Vulva presenting a transverse oval depression, with central posterior triangular tongue, whose anterior margins are continued on either side in the form of a coiled spiraloid oviduct *A. Marshii*, sp. n.
- b. Size much smaller, 14.3 mm.
 1. Vulva presenting anteriorly a large quadrate spade-like depression, concave within towards apex, which is bilobate. Produced posteriorly into a stem, dilate towards posterior margin, flanked on both sides by a horseshoe-shaped tuberculiform prominence, procurved, whose arms (transversely corrugate) terminate with a small shining boss. Cribellum divided in centre into two distinct triangular areas *A. spinipes*, Keys.
 2. Vulva presenting anteriorly on each side a spiraloid curving process. Central tongue dilate in centre on each side, with narrow black chitinous margin, posteriorly narrowed. Cribellum transverse oblong, not divided in centre into two distinct areas *A. Ridleyi*, sp. n.

1877. *Acanthoctenus spinigerus*, Keys. ♂, 12.5 mm. Verh. z.-b. Ges. Wien, p. 693, t. ii. (viii.) fig. 60. Mexico, Cordova. Type in coll. Brit. Mus. Nat. Hist. London. (Pl. IV. fig. iii. b.)

1877. *Acanthoctenus spinipes*, Keys. ♀, 14.3 mm. Verh. z.-b. Ges. Wien, p. 695, t. ii. (viii.) fig. 61. Type in coll. Brit. Mus. Nat. Hist. London. New Granada, Bogotá.

These two species belong to the subfam. *Acanthocteninae* of Simon, in the family *Zoropsidae*, where I leave them for the present in company with a new species—*A. Marshii*—described below, from the Amazons. They are separated by M. Simon from the other *Ctenoid* forms, on account of the presence of the calamistrum and cribellum. (Pl. IV. fig. iii. d.)

Acanthoctenus Ridleyi, sp. n., ♀.

Hab. Pernambuco, Brazil.

Type in coll. Brit. Mus. Nat. Hist. London.

Total length (including mandibles) 14 mm.

Colour. Carapace and legs mahogany-brown, the former with two lateral dark serrate bands on each side of the median line, the latter with indistinct annulations on the tibiae; protarsi and tarsi darker.

Structure. Similar in general character to the other forms of the genus, resembling, however, *A. spinipes*, Keys., rather than *Marshii*. Legs of first pair less than twice the total length (in *A. Marshii* they are more than twice the total length). Tibia i. with 7 pairs of spines beneath, ii. with 6-7 pairs beneath. Second row of eyes straight by anterior margins; ocular quadrangle broader than long, much narrower in front. Central posteriors large, less than half a diameter apart. Central anteriors much smaller, half a diameter apart. Clypeus equal to $1\frac{1}{2}$ diameter of anterior central eye.

Cribellum transverse, narrow, not divided into two triangular disks.

Vulva somewhat similar in general character to that of *Marshii*, but much less complicated. Central tongue dilate in middle on either side, with narrow black chitinous margins, anteriorly presenting on each side a spiraloid curving process, beneath which lies the oviduct.

This species was found among some spiders collected by Mr. Ridley in the neighbourhood of Pernambuco. (Pl. IV. fig. iii. e.)

*Acanthoctenus Marshii**, sp. n., ♀.

Hab. Santarem and Obidos.

Types in coll. Brit. Mus. Nat. Hist. London.

* It gives me much pleasure to connect this fine new species with the name of Mr. Marsh, by whose efforts our Amazonian collections, especially amongst the *Lepidoptera*, were considerably enriched

♂. Total length (including mandibles) 17 mm., ♀ 20 mm.

♂.—*Colour*. Carapace orange-yellow, with two broad brown bands with scalloped margins on either side of the central furrow. *Abdomen* dull orange-brown, mottled with brown and grey pubescence; with a broad central pale band, divided longitudinally in its first half by a brown line, transversely in its second by three Λ -shaped fine lines, terminating in a black spot at each end. The apical half bears dorsally two rows of three small tufts of fine grey hairs, with another row of the same on each side.

Legs pale orange, spinose, annulated with brown, and clothed between the annulations with hoary grey pubescence. Sternum and underside of abdomen dull yellow-brown.

Structure. Carapace with fine central line; profile-line concave, very and abruptly steep behind, and gibbous. Ocular region raised, lateral impressions deep.

Eyes. Centrals forming a quadrangle a little longer than broad, posteriors larger; laterals on a distinct tubercle; anteriors small, their diameter less than half that of posterior laterals, and more than their diameter distant from them. The lateral anteriors form with the central posteriors a procurving transverse line seen from in front. Clypeus narrower than diameter of anterior centrals.

Mandibles clothed with grey hairs. Fang-groove armed with 3 teeth on lower margin, 2 on upper at angle. Labium longer than broad, emarginate at apex, narrowed at base, half as long as coxæ of pedipalp. The latter parallel-sided, their inner margins smooth and slightly excavate, rounded at apex and tufted on inner apical angle with long curved hairs.

Legs 1, 4, 2, 3, long, and somewhat similar in action to those of the Laterigrades, armed with spines and clothed with fine silky yellow hairs, especially the tibiæ, protarsi, and tarsi of legs i. and ii. Femora i., ii., iii., and iv. spinose above, with two or three spines in front of first pair. Tibia i. with 8 pairs of long spines beneath (the number varies from 7 to 9 in the females), and a row of 3 or 4 on each side. Protarsus i. with 5 pairs of very long spines beneath, closely pressed against the scopula. Tibia ii. with 7-8 pairs of spines beneath and 3 or 4 spines on each side. Tibiæ and protarsi iii. and iv. with numerous spines. Tarsi of all four pair without spines.

Tarsal claws 2.

Pedipalp (Pl. IV. fig. iii. a, c). Femur with 5 or 6 stout spines on the upper inner side at apex. Patella with 2 spines on upperside. Tibia strongly emarginate on the outer side, curved, with two long spines and a tuft of long hair on the

inner side. Tarsus elongate-pyriform. Bulb simple, produced backwards at base, its apex terminating in two membranous prominences not well defined.

Measurements in millim.—♂. Carap. 7.5 long., 6.25 lat.; abd. 8.5 long., 4.5 lat.; stern. 3.25 long., 3 lat.; pedes long., i. 43, ii. 37, iii. 30, iv. 42; art. i. 2.75—5—10—3.5—12—10.25—4. Comparative measurements of female the same, except pedes i. 43, iv. 43.

♀. The structure of the body is the same as that of the male, except that the gibbosity of the carapace at base is less pronounced.

Vulva broader than long, consisting of a pair of shallow circular spiraloïd depressions, having between them posteriorly a small triangular piece.

Spinners 6, with a cribellum before the anterior pair; posterior pair slightly longer, with distinct terminal joint in the male, but not so noticeable in the female.

This large species was abundant in the neighbourhood of Santarem and in the Forest, as well as at Obidos. Its habit much resembles that of *Leiocranum rupicola* of Europe. It lurks beneath stones, pieces of timber, or tiles, sitting quite flat and close to the surface, darting round to the opposite side with extraordinary speed, and after the fashion of a "heteropod." Several females, almost adult, were taken, one adult male, and one adult female, whilst of the immature numerous specimens occurred. The webbing with which I found this spider connected was loose and flocculent, spread over the surface of the stone; but so rapidly did the spiders retreat, that I was unable to make any observations on their habits. They occurred abundantly amongst the stacks of the roofing-tiles piled up near the saw-mills in the neighbourhood of Santarem.

EXPLANATION OF THE PLATES.

PLATE III.

- i. *Ctenus*. Eyes in front of:—(a) *Ctenus Reidyi*, ♀; (b) *C. sinuatifpes*, ♀; (c) *C. similis*, ♀; (d) *C. albofasciatus*, ♀.
- ii. *Ctenus*. Vulva. (a) *C. Reidyi*, (b) *C. Andrewsii*, (c) *C. Keyserlingii*, (d) *C. nigriventer*.
- iii. *Ctenus boliviensis*. (a) Palpal bulb from beneath; (b) central lobe; (c) tibial spur of pedipalp.
- iv. *Ctenus*. Vulva. (a) *C. similis*, ♀; (b) *C. albofasciatus*, ♀; (c) *C. minor*, ♀; (d) *C. sinuatifpes*, ♀.
- v. *Ctenus*. *C. minutus*, ♂. Tibia of pedipalp, (1) from above, (2) from outside.
- vi. *Ctenus*. Protarsus and tarsus iv. of ♂. (a) *C. nigrifus* and *C. reotipes*, (b) *C. planipes*, (c) *C. serratifpes*, (d) *C. curvipes*, (e) *C. sinuatifpes*, (f) *C. medius*.

- vii. *Otenus*. Tibial apophysis of pedipalp. (a) *C. nigratus*, from outside; (b) *C. rectipes*, from outside; (c) *C. planipes*, from outside; (d) *C. serratipes*, from above; (e) *C. curvipes*, from below; (f) *C. sinuatus*, from above, with apophysis enlarged; (g) *C. medius*, from outside; (h) *C. spiculus*, from outside.

PLATE IV.

- i. *Lycotenus*. Palpal bulb from below. (a) *L. brunneus*, ♂; (b) *L. Hewitsoni*, ♂; (c) "unca" of bulb, (1) *L. gigas*, (2) *L. brunneus*, (3) *L. demerarensis*, (4) *L. colombianus*; (d) tarsal claws of *L. brunneus*, ♀.
- ii. *Lycotenus*, Vulva. (a) *L. brunneus*, ♀, from above; (b) *L. bogotensis*, from above; (c) *L. brunneus*, in profile; (d) *L. bogotensis*, in profile.
- iii. *Acanthotenus*. (a) *A. Marshii*, ♂: tibia and tarsus of pedipalp from outside; *aa*, tibial spur; *bb*, apical spine. (b) *A. spinigerus*, ♂: *aa*, tibial spur. (c) *A. Marshii*, ♀: vulva. (d) *A. spinipes*, ♀: vulva. (e) *A. Ridleyi*, ♀: vulva.
- iv. Cribellum and plan of spinners: (a) *A. Marshii*, ♀; (b) *A. Ridleyi*, ♀.
- v. *Stenotenus pallidus*, ♂. Tibia and tarsus of pedipalp, (a) from outside, (b) from beneath.
- vi. *Calotenus aculeatus*, ♀ (type). Eyes from in front.

Note.—The figures of *C. curvipes*, Keys., are from Keyserling's figures.

VIII.—Descriptions of new Malay Frogs.

By G. A. BOULENGER, F.R.S.

Ixalus vittiger.

Snout truncate, not projecting, as long as the diameter of the orbit; canthus rostralis distinct; loreal region concave; nostril nearer the tip of the snout than the eye; interorbital space broader than the upper eyelid; tympanum distinct, half the diameter of the eye. Fingers with a rudiment of web; toes two-thirds webbed; disks smaller than the tympanum; a small inner metatarsal tubercle. The tibio-tarsal articulation reaches the tip of the snout. Skin smooth above; throat smooth; belly granulate. Pale grey above, spotted all over with black; a white, black-edged streak on each side from eye to groin, another on the arm, and a third on the thigh; forearm and tibia spotted with black; lower parts white.

From snout to vent 22 millim.

A single specimen from Pengalengan, Java, 4000 feet, collected by Hr. H. Fruhstorfer.

Ixalus mindorensis.

Snout subacuminate, not projecting, as long as the diameter of the orbit; canthus rostralis distinct; loreal region concave; nostril slightly nearer the tip of the snout than the eye; interorbital space broader than the upper eyelid; tympanum distinct, one third to two fifths the diameter of the eye. Fingers free; toes one-third webbed; disks as large as or a little smaller than the tympanum; a small inner metatarsal tubercle. Tibio-tarsal articulation reaching the nostril or the tip of the snout. Skin smooth above; throat and belly granulate. Grey above, sides paler, sometimes with a dark brown lumbar streak; temples, and sometimes the lores, dark brown; a white streak along the upper lip, or an oblique white streak below the eye; limbs with more or less distinct dark cross-bands; lower parts white, uniform or spotted or marbled with brown.

From snout to vent 29 millim.

Several specimens from Mindoro (Mount Dulangan, 5000 feet), presented to the British Museum by the Subscribers to the Whitehead Expedition Fund.

Ixalus leitensis.

Snout subacuminate, not projecting, as long as the diameter of the orbit; canthus rostralis distinct; loreal region concave; nostril nearer the tip of the snout than the eye; interorbital space a little broader than the upper eyelid; tympanum hidden. Fingers free; toes one-third webbed; disks of fingers large, of toes a little smaller; a small inner metatarsal tubercle. Tibio-tarsal articulation reaching a little beyond the tip of the snout. Skin shagreened above; a strong temporal fold; throat and belly granulate. Reddish brown above, with a pair of black spots on the anterior part of the back; limbs with rather indistinct darker cross-bands; groin, sides of thighs, and lower surface of tibia dark brown; a black blotch on the vent, edged with yellowish above; a yellowish spot at the heel; throat and belly whitish.

From snout to vent 20 millim.

A single specimen from Leyte, Philippines, presented to the British Museum by the Subscribers to the Whitehead Expedition Fund.

Engystoma borneense.

Remarkably similar to the South-American *E. microps*. Snout very long, pointed, strongly projecting; eye small, two fifths the length of the snout; interorbital space thrice as broad as the upper eyelid. Fore limb a little longer than its distance from the tip of the snout; fingers short, swollen at the end, first shorter than second; toes quite free, the tips swollen into small disks; a very small inner metatarsal tubercle. The tibio-tarsal articulation reaches the posterior border of the eye, the tarso-metatarsal the tip of the snout. Skin perfectly smooth. Blackish brown above, with scattered minute white dots; brown beneath.

From snout to vent 39 millim.

A single specimen from the Baram district, Sarawak, collected by Mr. C. Hose.

Microhyla * *palmipes*.

Habit slender. Snout rounded, as long as the diameter of the orbit; interorbital space broader than the upper eyelid. Fingers merely swollen at the end, first much shorter than second, third twice as long as second or fourth; toes two-thirds webbed, with small terminal disks; two extremely small oval metatarsal tubercles. The tibio-tarsal articulation reaches the tip of the snout. Skin smooth. Grey-brown above, with symmetrical, darker, light-edged markings, viz. a triangle between the eyes, a large Λ -shaped figure on the back, and a dark oblique band from the eye to the middle of the side; a dark oblique bar on the thigh and another on the tibia; anal region black; a black spot on the inner side of the tibia, a little above the heel; lower parts whitish, throat and belly with a few brown specks; lower lip dark brown with white dots.

From snout to vent 18 millim.

A single specimen from Pengalengan, Java, 4000 feet, collected by Hr. H. Fruhstorfer.

* The pupil in *Microhyla* and *Callula* is round, not vertical, as erroneously stated by me in the 'Catalogue of Batrachians.'

IX.—On some Trapdoor Spiders of the Family Ctenizidæ from South and West Australia, contained in the Collection of the British Museum. By R. I. POCKOCK.

THE four genera discussed in this paper, all belonging, as I believe, to the Cyrtauchenienæ, form an interesting series wherein the arrangement of the eyes passes from that of *Aganippe*, which is but a slight exaggeration of the pattern observable in *Cyrtauchenius*, to that of *Idiosoma*, which, as implied by the name, is comparable to the formula found in *Idiops* and its allies. The gradual assumption, too, of the integumental characters of the abdomen is clearly indicated, the normal hairy clothing of *Aganippe* passing into the aberrant spinous covering of *Idiosoma* through the form called *Anidiops*, where the hairs are dorsally intermixed with strong spines.

Genus IDIOSOMA, Ausserer.

Idiosoma, Ausserer, Verh. z.-b. Wien, 1871, p. 150.

Belonging to the group Cyrtauchenienæ of the family Ctenizidæ, but characterized by the arrangement of the eyes, which much resembles that of *Idiops*, and by the coriaceous spinous wrinkled cuticle of the posteriorly truncate abdomen, which approaches that of *Cyclocosmia* and *Chorizops*.

Type *I. sigillatum* (Cambr.).

This genus, established by Ausserer for the reception of the peculiar species named *Idiops sigillatus* by O. P. Cambridge, was, by Mons. Simon, regarded as a synonym of *Acanthodon* (Hist. Nat. Araignées, p. 91, 1892). The antagonistic opinions of these authors were based upon the characters presented by the type specimen, which belongs to the male sex; and it may be inferred that whereas Ausserer regarded them as of generic value, to Simon they were merely of sexual importance. The discovery, however, that the female differs greatly from the female of the *Idiopæ* in the scopulation and spine-armature of its legs, as well as in the form of the labium, abdomen, &c., is sufficient justification for the re-establishment of Ausserer's genus.

Idiosoma sigillatum (Cambr.).

Idiops sigillatus, Cambridge, Proc. Zool. Soc. 1870, p. 105, pl. viii fig. 2.

♀.—*Colour*. Cephalothorax and limbs uniform chestnut, cephalic region of the former paler; abdomen dirty yellow, tinted with black, with a fine yellow longitudinal dorsal band.

Carapace longer than wide, its width just about equal to the distance between the posterior border and the posterior row of eyes; fovea deep, lightly procurved, radiating grooves strongish; cephalic area moderately elevated.

Eyes arranged as in the *Idiopeæ*, the anterior laterals occupying an isolated position close to each other on each side of the middle of the anterior border, separated by a space that about equals their own radius, and tilted up posteriorly, so as to look forwards and upwards; the rest of the eyes occupying a wide transverse elevated area some distance behind; the anterior medians a little smaller than the front (anterior lateral) pair, separated from each other by a distance equal to about half their diameter, and from the front pair, as well as from the posterior laterals, by a space almost or quite equal to twice their diameter; the posterior laterals elliptical, nearly twice as large as the anterior medians; the posterior medians the smallest, a little less than half the size of the anterior medians, from which they are separated by a space which about equals their diameter, widely separated from each other, the space between them being about twice the space between them and the posterior laterals, the last-named space being about equal to the long diameter of a posterior lateral eye.

Mandibles of medium strength, not geniculate, mostly smooth above at the base, hairy in front, armed with a distinct rake consisting of about a dozen pointed black tubercles lying along the inner edge of the segment and occupying a small prominence above the base of the fang; external surface of mandible not hairy, lightly wrinkled; the lower edge furnished with a fringe of hairs externally and with two rows of teeth, the outer consisting of four and the inner of seven (eight), with a few between them posteriorly; fang shortish, stout.

Labium small, wider than long, bent downwards, and separated from the sternum by a deep groove, deeply sunk between the maxillæ, unarmed.

Sternum much longer than wide, widest between the coxæ of the third legs, marked with the normal three pairs of muscular scars (sigillæ), those corresponding to the first legs small, marginal; the following pair also small and submarginal, the posterior pair small and oval, well removed from the margin, their distance from the margin being about half the distance between the two.

Abdomen ovate, its upper surface in its posterior half flattened from side to side, and furnished with three pairs of muscular scars or sigillæ—the anterior pair faint and widely

separated, the middle pair large, conspicuous, and lodged in a transverse depression of the integument; the posterior pair closer together than the others, smaller than the median but more conspicuous than the anterior; the integument coriaceous, longitudinally grooved in front, transversely behind and below, scantily hairy; the upper surface of the abdomen armed with short backwardly directed spines, elevated on distinct granuliform tubercles.

Spinners. Two pairs, the anterior short, conical, the posterior also conical; the apical segment minute, the second shorter than the basal.

Palpi. Maxilla longer than wide, furnished below with setæ, intermixed with short setiform spinules, the base armed internally with a cluster of the thick normal spiniform tubercles; surface between the fringe and the suture bristly; trochanter, femur, and patella bristly below; the tibia also bristly, about four of the bristles on each side stout and spiniform; tarsus about as long as the tibia, somewhat thickly scopulate on each side, nearly naked below, armed with two pairs of basal spines, apically with about five shorter spines in the middle; claw armed with two basal teeth, the lower long and bifid.

Legs. First and second pair with tarsi and protarsi scopulate externally and internally, weakly spined; tibia of first armed externally with 3 to 5 spines, and with 1 internally at the apex; protarsus with 4 externally, 2 internally, and 1 mesially, 4 altogether being placed along the lower apical margin; tarsus only spined apically below the claw, as in the palpus; second leg spined like the first, except that there are a few more spines on the protarsus; third leg with femur sparsely hairy, patella and tibia coarsely bristly above, the former armed in front with a few (about 9) short spines, the latter with 2 short spines in front and some half-dozen long spiniform setæ below; protarsus sparsely bristly, armed above with two rows of 5 to 6 stout spines and below with about 8 spines somewhat irregularly arranged; about 9 spines altogether arranged round the distal margin of this segment; tarsus armed with about a dozen spines below; fourth leg with femur sparsely hairy, a few stout bristles below, thickly studded with short bristles at the apex above; patella furnished above with short bristles; tibia armed below with 8 setiform spines arranged in two rows; protarsus with about 12 spines below, 2 above; tarsus armed with about a dozen spines below; *claws* of legs with a few teeth, 2, 3, or 4, two long and strong, the others small and sometimes absent.

Measurements in millimetres.—Total length (including mandibles) 20; length of carapace 7, width 5; length of

abdomen 10·5, width 8·5; length of first leg (from base of femur) 15, of second 13, of third 12·5, of fourth 16, of palp 12; width of mandibles at base 4·5; length of sternum 5, width 3.

Loc. Perth, W. Australia (*H. W. J. Turner*). Mr. Cambridge's specimen was from the Swan River (Perth).

In spite of the fact that its eyes are arranged as in Simon's group *Idiopeæ* of the subfamily *Ctenizinae*, this genus is without doubt to be referred, not to that section, but to the *Cyrtachenieæ*, as its scopulate and weakly spined tarsi and protarsi indicate. From all the genera of *Cyrtachenieæ*, however, it may be recognized by the arrangement of its eyes, as well as by the posteriorly truncate, hardish, wrinkled-skinned abdomen—a feature in which it presents resemblances to *Chorizops* and *Cyclocosmia*, both of which, however, present an entirely different eye-formula.

Genus AGANIPPE, Cambr.

Aganippe, Cambridge, Ann. & Mag. Nat. Hist. (4) xix. p. 28 (1877); Simon, Hist. Nat. Araignées, i. p. 103; Pocock, Ann. & Mag. Nat. Hist. (6) xvi. p. 223 (1895).

Type *Aganippe subtristis*, Cambr. *ibid.* pl. vi. fig. 3.

In spite of the differences observable between them in the arrangement of the eyes and the structure of the abdomen, the genera *Aganippe* and *Idiosoma* cannot, I think, be far separated in a natural classification of spiders.

Apart from the two characters just mentioned, the principal differences between them seem to be as follows:—

The scopulæ on the palpi and on the first and second legs are thicker, and these appendages are armed with fewer spines; for example, the tibia of the palp has two pairs at its apex and the tarsus one externally at the base; the tibia of the first leg is practically without spines, though some of the setæ are thickened; on the protarsus there are 2 or 3 apical spines and 1 external basal spine; on the second leg there are also a few spiniform setæ intermixed with the bristles on the tibia, while on the protarsus there are 4 apical spines and about 3 long spines on the inner surface; the tibiæ of the third and fourth legs are at most weakly spined below, while the protarsi are somewhat strongly spined both below and in front, while the tibia and protarsus of the third are also spined above posteriorly; the tarsi of all the legs are spiny below, those of the first, second, and third at the tip, of the fourth posteriorly as well. The third and fourth legs are noticeably stouter than the first and second, the difference being much greater than in *Idiosoma*.

The labium seems to be substantially the same as in *Idiosoma*, being merely setose not spiny and sunk between the maxillæ, which are spiny anteriorly throughout their length; the sternum, too, is wider posteriorly, the width being 5.5 and the length 6.5; and the sigilla corresponding to the second leg is removed farther from the margin.

The mandible armed below with 9 internal, 8 external, and 8 teeth forming an intermediate set; the tubercular teeth forming the rastellum are restricted to the process and to a short area on the margins above and external to it.

Loc. Adelaide (S. Australia).

EUCYRTOPS, gen. nov.

Closely allied to *Aganippe*, but with different ocular arrangement, the anterior laterals closer together, so that the quadrangle formed by them and the posterior medians is a little wider behind than in front, and only a little wider than long, whereas in *Aganippe* this quadrangle is very noticeably wider than long, and, considered from the outer rim of the eyes, a little wider in front than behind; again, the posterior line of eyes in *Eucyrtops* is about three times as wide as the anterior line (only about twice in *Aganippe*), and a line drawn through the centres of the anterior and posterior laterals will, if produced, cut the lateral margin of the carapace at a point in front of the articulation of the third leg, while in *Aganippe* such a line will emerge behind the articulation of this appendage.

Type *Eucyrtops latior* (Cambr.).

Eucyrtops latior (Cambridge).

Aganippe latior, Cambridge, Ann. & Mag. Nat. Hist. (4) xix. p. 20, pl. vi. fig. 4 (1877).

In this species the lower side of the tibia of the palp is furnished externally and internally with long spines, those at the distal extremity being stronger than the rest, and the tarsus has 3 spines in its basal half and others at the apex partially buried in the scopula; the protarsus of the first leg has two pairs of spines, while the tibia has 3 long apical spines and 1 farther back on its lower side; on the second leg the tibia has a pair of long apical spines below and some long slender ones behind, the protarsus an anterior pair and some half-dozen irregularly arranged posterior spines; on the third leg the patella has some half-dozen, and the tibia two spines in front, while the protarsus has two series of spines above and a few apical and one posterior

Ann. & Mag. N. Hist. Ser. 6. Vol. xix.

8

spine below; on the fourth leg the protarsus is armed with some half-dozen antero-inferior spines. The tarsi of both palpi and legs are apically spined below, the spines increasing in number with the disappearance of the scopula, so that on the fourth tarsus the distal half of the segment is spinous; the upper claws on the legs and palpi are armed with one long spine, with usually a minute spinule as well, rarely there are two longish spines.

The sternum and labium are as in *Aganippe subtristis*; the maxillæ are spinous at the base and the mandible is armed below with 7 (8) internal, 9 external teeth, and an intermediate line of 10 teeth; the tubercular teeth of the rastellum practically as in *Aganippe subtristis*.

Loc. Perth, West Australia (*George Clifton*).

ANIDIOPS, gen. nov.

Closely allied to *Idiosoma* in the majority of its characters, but differing in having the abdomen covered above and below with a clothing of longish hairs intermixed above with spines, and in the arrangement of the eyes, the formula of which is a little less like that of *Idiops*. For example, the anterior lateral eyes (the front pair), although situated on the anterior margin of the carapace, are nevertheless separated by a space which is about equal to their diameter; again, the distance between the anterior medians is at least equal to their diameter, and the posterior medians are about twice their diameter from the anterior medians.

Anidiops Manstridgei, sp. n.

Colour (dry specimen) chestnut-brown, mandibles and ocular area blacker.

Carapace much longer than wide, its width (dry specimen!) much less than the distance between the hinder border and the eye-cluster; head wide, its width about equalling the distance between the fovea and the anterior border, as in *Eucyrtops lator* (in *Aganippe subtristis* and *Idiosoma sigillatum* the head is considerably narrower than this distance).

Mandible strong, broad at the base; rastellum as in the other genera; teeth below in three rows, 8, 9, 8. *Maxillæ*, *coxæ* of legs (especially of first and second pairs), anterior part of sternum, and labium covered thickly with pores elevated on tubercles, indicating the presence of a clothing, unhappily rubbed off, of stout setæ or, perhaps, spines. *Maxilla* armed with short spines along the whole of the inner surface; femur of palp with many stout setæ; tibia externally with 4

long spines, internally with 7 intermixed with setæ; tarsus with 3 basal and several apical spines.

First leg with tibia armed externally with a few spiniform setæ; protarsus armed below with 4 apical and 4 external spines; second leg with substantially the same spine-armature as the first; third leg as in the other species, tibia and patella furnished with stout setæ above intermixed with spines in front, protarsus with two series of spines above and a few apical spines below, tarsus spiny in front and below; fourth leg with a few spines amongst the setæ at the apex in front, protarsus and tarsus spiny throughout their length below. Legs bent up and not accurately measurable; the third and fourth stouter than the others, 4, 1, 2, and 3 apparently subequal in length.

Measurement in millimetres.—Total length (including mandible) 21; length of carapace 9, width 6.5, width of head 6, of mandibles at base 5.5.

Loc. Lawlers, East Murchison Goldfields, West Australia. A single female example sent to the British Museum by Mr. W. O. Manstridge, after whom I have great pleasure in naming this interesting new form.

To recapitulate: the females of the genera here considered have the following characters in common:—The carapace is considerably longer than wide, nearly smooth, with procurved fovea and elevated head. The anterior lateral eyes are well in advance of the others and are situated either close together or some distance apart upon the anterior border of the carapace; the mandibles are armed with a strong rastellum, consisting of strong short spines and a spinous process on the apical internal angle, and below with two rows of larger teeth as well as some smaller ones that constitute a shorter third intermediate row.

The tarsus of the palpi and the tarsi and protarsi of the first and second legs are scopulate and weakly apined, there being no lateral rows of spines such as are characteristic of the Idiopsea and Pachylomereæ. The claws of all the legs are armed basally with one or two long teeth and one or two minute ones.

The sternum is longer than wide, with three distinct pairs of sigillæ, excluding the pair that embraces the labium. Labium short and broad, not spinous, depressed between the maxillæ.

The genera, each of which, so far as at present known, has but a single species, may be recognized by the following table:—

- a.* Integument of abdomen coriaceous, wrinkled, sparsely hairy, covered dorsally with short spines, and deeply impressed posteriorly with sigillæ. Eyes like those of *Idiops*, the anterior laterals separated by a space that is less than their diameter *Idiosoma*, Auss.
- b.* Integument of abdomen covered with longish hairs, with sigillæ inconspicuous.
- a'.* Eyes of posterior row procurved, the laterals in advance of the medians; the distance between the anterior laterals and anterior medians not very unequal; long spines intermixed with the hairs on the dorsal side of the abdomen *Anidiops*, nov.
- b'.* Eyes of posterior line recurved, the laterals behind the medians; distance between anterior laterals far greater than distance between anterior medians.
- a².* Quadrangle formed by anterior laterals and posterior medians a little wider behind than in front and a little wider than long; posterior line of eyes about three times as wide as the anterior line *Eucyrtops*, nov.
- b².* Quadrangle formed by anterior laterals and posterior medians a little wider in front than behind and considerably wider than long; posterior line of eyes about twice as wide as the anterior line *Aganippe*, Cambr.

X.—*Descriptions of Two new Species of Scorpions from East Africa.* By R. I. POCKOCK.

AMONGST a small assortment of Arachnids from Kota Kota, west coast of Nyasa, recently brought to the British Museum by Mr. R. Webb, and collected by the members of the Universities' Mission, there are representatives of two new species of scorpions, which are here described. The remaining specimens seem to be referable to the following species:—*Nephila malabarensis*, Walck., *Nephila hymenaea*, Gerst., *Palystes* (immature ♀), *Euprostenops* * (immature ♀), *Solpuga paludicola*, Poc., and *Opisthophthalmus glabrifrons*, Pet.

Opisthacanthus rugiceps, sp. n.

Species with the legs and vesicle ochre-yellow, and falling under section *b²* of the table of South-African species of *Opisthacanthus* published in the Ann. & Mag. Nat. Hist. (6)

* Nom. nov. for *Podophthalma*, Capello, 1866, preoccupied at least twice over.

xvii. pp. 314-315, April 1896, and related to *O. rugulosus*, from Ishiromo, Nyasaland, there described—a species which it resembles in having the trunk thickly granular above. The two, however, may be recognized as follows :—

- a. Median eyes small, not elevated; upperside of the brachium more closely and less coarsely granular, the crest bounding it posteriorly weak; the sculpturing of the upper surface of the hand finer, less reticulated, more definitely granular; upperside of the fourth and fifth segments of the tail distinctly granular; none of the caudal segments with distinctly carinate upper edges; spine-armature of tarsi 3 in front, 4 behind, with a bristle at the distal angle; pectinal teeth 6 in ♂; legs piceous *rugulosus*, Poc.
- b. Median eyes larger and elevated on a low tubercle; upperside of brachium covered with tuberculiform granules, and bounded behind by a strong tubercular keel; upperside of hand covered with a pattern of distinct ridges, formed by the anastomosis of granuliform tubercles; these tubercles distinct at the base of the finger; upperside of fourth and fifth caudal segments not granular, the former segment as well as the third with distinctly carinate and denticulate upper edges; spine-armature of tarsi 2 in front and 3 behind, with a bristle at the distal angle; pectinal teeth 10; legs ochraceous *rugiceps*, sp. n.

Measurements in millimetres.—Total length 78; length of carapace 11·5, of tail 40; width of hand 8·5; length of hand-back 10, of movable digit 11.

Loc. Kota Kota, west coast of Lake Nyasa (Universities' Mission). A single male example was obtained.

Had it not been for Kraepelin's statement to the effect that the species from the Transvaal that was described as *O. lævipes* is identical with *O. asper* of Peters, I should without hesitation have applied Peters's name to the form that was described as new; for not only is the name *asper* as appropriate for this form as it is inappropriate for *lævipes*, but, in addition, the locality Tete, on the Zambesi, whence *asper* was obtained, is twice the distance from the Transvaal that it is from Kota Kota. *O. rugiceps*, though resembling *O. asper* (*lævipes*) in the number of its pectinal teeth, differs in having the terga granular, the hand and brachium also coarsely sculptured, and the femora of the legs weakly granular externally. In *asper* (*lævipes*), moreover, the distal angle of the tarsus is armed with a spine, not with a bristle as in *rugiceps*.

Uroplectes xanthogrammus, sp. n.

♀. *Colour* yellow and black; interocular area of carapace black, the black extending posteriorly past the ocular tubercle to the posterior border, which is further adorned with black patches corresponding to those on the terga; lateral margin black; terga with black lateral margins and a posteriorly widened black band on each side of the yellow middle line; the area between the margin and the black band often largely infuscate, especially on the third, fourth, and fifth segments; the seventh segment with only traces of the black bands; tail with fourth and fifth segments and the vesicle infuscate, the lower surface of the first three segments with traces of black bands, which are represented by a pair of posterior spots on the first and three anterior and three posterior spots on the second and third, those on the third connected by longitudinal indistinct bands; legs flavous, the femora and patella infuscate in front below; palpi mostly flavous, the basal half of the digits black, with sometimes indistinct fuscous spots on the hand and brachium; in one specimen there is a deep pigment-spot on the base of the humerus behind, and another on the base of the brachium in front; mandibles covered with a network of fuscous lines; lower surface of trunk entirely pale.

Carapace finely, *terga* more coarsely granular, especially posteriorly. *Tail* keelless, with at most, perhaps, traces of an upper keel on the first segment, the upper keels on the rest represented posteriorly by a granule, the sides and lower surface coarsely punctured; sulcus on upperside of all the segments granular; vesicle smooth, coarsely punctured, with a distinct tubercular tooth below the aculeus; superior edges of the fifth caudal segment angular behind.

Chelæ with brachium smooth and punctured above, hand about as wide as the brachium, smooth; movable digit twice the length of the hand-back; with 12 rows of teeth, the eighth tooth (fifth from the apex) of the inner row on a level with the tip of the adjacent series of the middle line.

Pectines with 18 or 19 teeth, the basal not enlarged.

♂. Like the female, but with tail longer and thinner, about seven instead of six times the length of the carapace; vesicle more oval; hand a little longer, with from 2 to 5 spines on its inner side at the base of the immovable digit; pectines enlarged, with 18 teeth.

Measurements in millimetres.—Total length of female 48, of carapace 4, of tail 24. Length of male 32, of carapace 3, of tail 22.5.

Loc. Kota Kota, west coast of Nyasa (Universities' Mission). Five females and one male.

So far as my knowledge of the genus extends, this is a very distinct species, falling partly into section 2 and partly into section 3 of the table of South-African species of *Uroplectes* published in *Ann. & Mag. Nat. Hist* (6) xvii., May 1896. It approaches *occidentalis*, *vittatus*, and *Fischeri* in colour and in having the caudal segments smooth, punctured, and keelless; and *olivaceus*, *triangulifer*, and *chlorodermus* in having the hand of the male spinous internally; further approaching *triangulifer* and *Marshalli* in having the basal pectinal tooth of normal size in the female.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

November 18, 1896.—Dr. Henry Hicks, F.R.S.,
President, in the Chair.

The following communications were read:—

1. 'On *Cycadeoidea gigantea*, a new Cycadean Stem from the Isle of Portland.' By A. C. Seward, Esq., M.A., F.G.S.

The specimen described by the Author was discovered a short time since in one of the Purbeck Dirt-beds, and is now in the Fossil Plant gallery of the British Museum. In the absence of any fructification, Buckland's generic name of *Cycadeoidea* is chosen in preference to *Bennettites*, although in many respects the Portland stem is identical with *Bennettites Gibsonianus*. Externally, the surface is covered with rhomboidal areas separated from one another by a projecting framework consisting of the silicified ramental tissue, which thickly clothed the bases of the petioles. The peripheral portion of the stem afforded thin sections from which it was possible to investigate the anatomical structure of the leaf-bases and ramental scales. Internally, the wood- and pith-tissues have been entirely replaced by inorganic material. The Author calls attention to the preservation of a prominent apical bud covered with narrow bud-scales and capped by a mass of ramenta. No indication is found of a lateral inflorescence such as characterizes *Bennettites Gibsonianus*, and the negative evidence suggests the occurrence of terminal reproductive structures. A comparison of this fossil with recent Cycads and Ferns brings out many points of close agreement with the former, and as regards the structure of the ramenta, evidence is afforded of an interesting survival of the closer resemblance which formerly existed between Cycadean and Fern-like plants. The stem is named *Cycadeoidea gigantea*.

2. 'The Fauna of the Keisley Limestone.—Part II. Conclusion.' By F. R. C. Reed, Esq., M.A., F.G.S.

The Author describes the ostracoda, brachiopoda, mollusca, echinodermata, and actinozoa of the Keisley Limestone. He gives a list of

fossils from the Limestone, and indicates those species which occur in the Limestone of Kildare, the *Leptæna*-Limestone of Sweden, and Stage F of the East Baltic provinces. As a result of his researches he concludes that the fauna has a thoroughly Ordovician facies; that it is closely comparable with that of the Limestone of the Chair of Kildare, and of the *Leptæna*-Limestone, and less closely with that of Stage F of the East Baltic provinces; that its palæontological features point to its stratigraphical position being at the base of the Upper Bala, and that it must be regarded as the locally thickened development of a bed which is elsewhere in Great Britain very thin, or entirely absent, or represented by beds having different lithological characters and a different fauna; and that the fauna has certain unique characters which mark it off from all other known assemblages of fossils in Great Britain.

MISCELLANEOUS.

"*The most pious priority purist*" on the Lobster, the Crayfish, and Professor Bell. By the Rev. THOMAS R. R. STEBBING, M.A., F.R.S., F.L.S.

PROFESSOR BELL, in the 'Annals' for December 1896, has very obligingly undertaken, for the benefit of "priority-claimers" in general and as a warning to the 'Athenæum' in particular, to comment on some of the names and dates in my 'History of Crustacea.' In his essay there are some pleasing autobiographical touches. He begins by reminding the reader that in 1891, with regard to the name *Holothuria*, he established a precedent, to be a beacon-light to all zoologists in the present and a rule of conduct for future generations. In the course of his paper, while dealing with questions that are absolutely bibliographical, he naively says "I am no bibliographer"—a remark which might have been set down as a flourish of rhetorical modesty, had it not been surrounded by the corroborative evidence of his general argument. His conclusion needs no gloss: "I have taken," he says, "a great deal of trouble with this case, and I have a suspicion that if a few more would be equally 'eingehende' we might speedily give the purists the short shrift I have often wished them."

The criticism which leads up to this terror-striking sentence must now be examined in detail. "First," says the professor, "as a matter of accuracy in dates and names: on p. 202 of Mr. Stebbing's work already referred to, '*Nephrops*, Leach, 1819,' should have the date corrected to 1814." This, I eagerly admit, is a really meritorious performance on Professor Bell's part. He does not say whence he obtained the date 1814, but it may be inferred that he derives it from the mention of *Nephrops* in Brewster's 'Edinburgh Encyclopædia,' vol. vii. pp. 398, 400. The date of Leach's article "Crustaceology" in that volume is 1814, or perhaps 1813. Under "Genus XLI. *Astacus*," Leach, introducing his own name as if it were that of a stranger, remarks that "In *A. gammarus* and *fluviatilis* the external antennæ are simple, in *norvegicus* furnished with a scale at their external base: this last is considered as a

distinct genus by Mr. Leach, under the name of *Nephrops*, from the kidney-shaped eye." Then follows the account of "Sp. 1. *Gammarus*," and two pages further on come the accounts of "Sp. 2. *Fluviatilis*," and "Sp. 3. *Norvegicus*," the synonymy of the last being "*Cancer norvegicus* of Linné, *Astacus norvegicus* of Pennant, and *Nephrops norvegica*, Leach's MSS." Thus Leach's genus *Astacus*, in 1814, contained three species, not two only as Prof. Bell wishes us to believe. The next genus is "XLII. THALASSINA." *Nephrops* is nowhere included in the count. When considering the question some years ago, I was clearly of opinion that Leach did not here establish the genus *Nephrops*, and, to pursue the autobiographical method, I am of the same opinion still. No doubt he gives a strong hint that he thinks it ought to be established. But the contumely and struggle for existence to which many of his now accepted genera were in their earlier days exposed may explain his reluctance in this instance to do what he thought right. In the Trans. Linn. Soc. vol. xi. 1815, and in part 7 of his 'Malacostraca Podophthalmata Britannicæ,' published Jan. 1, 1816, he takes courage and definitely adopts the genus *Nephrops*, the date of which should therefore be neither 1819 nor 1814, but 1815, as it has been already some time back correctly given by the American writer, Dr. F. H. Herrick.

Next he says "'*Astacus*, Leach, 1814,' on the same page [Hist. Crust. 202], should be altered to—well, it is hard to say; Leach's *Astacus* of 1814 is the *Astacus* of Gronovius (1764) as emended by Fabricius and others, and by Leach's removal of *A. norvegicus*." This is led up to by an earlier paragraph as follows:—"Leach's genus *Astacus*, in 1814, contained two species—*A. gammarus* and *A. fluviatilis*. The former stood first, and is therefore, I presume, regarded as the 'type species'; on this I would remark that the generic name *Astacus* was invented by Gronovius in 1764 and that his first species is clearly *Cancer fluviatilis* of Linnæus."

On this I would remark that in 1814 Leach had not removed *A. norvegicus* from *Astacus*, but made it the third species of that genus, and that the generic name *Astacus* was not invented by Gronovius in 1764, and that it was not invented by Gronovius at all. Seeing that he was already using it in 1760, he could not have invented it in 1764. It is amusing to find Professor Bell quoting such a date without the least intimation that so lately as 1890 (see Geol. Mag., Dec. 1896, pp. 557-8) high officials in his own museum would have disputed its relevancy. At that time 1766 was still regarded there as the beginning of all things in zoological nomenclature. With good reason an earlier date for that beginning is now finding acceptance, but no decisive ordinance on the subject has yet been promulgated, so that professors and official dignitaries above all ought to deal tenderly with outsiders helplessly suffering from this "centre of wobulation." Waiving, however, any appeal *ad misericordiam*, we turn to the selected authority Gronovius, and then a wonder comes to light, or what might have been a wonder and might have been a discovery, had it not been

a thing notorious, a piece of elementary knowledge in this line of research, that Gronovius is in no sense an authority for Linnean nomenclature. He is as much a pre-Linnean in regard to names as if he had written in the seventeenth instead of in the eighteenth century. He does not name his species, but gives definitions. He still uses the cumbersome method, from which it was the great glory of Linnaeus to relieve zoology. But, whether Gronovius be deemed to be within or without the era of Linnean terminology, whether he be an authority or not, there is something almost comic in the notion that he invented the generic name *Astacus*. Seba, who, though not a binominalist, at least gives names to some of his species, in the third volume of his 'Thesaurus,' which has 1758 on the titlepage, has several *Astaci* scattered about, the first-mentioned being "*Astacus fluviatilis, Americanus*," not a crayfish, but a prawn, and the second "*Astacus marinus, Americanus*," the American lobster. Any one who may nevertheless fancy that Seba borrowed *Astacus* from Gronovius should consult the 'Fauna Suecica' of Linnaeus, 1746. On page 358 will be found the two numbers, 1248, 1249, each referring to a "*Cancer macrourus*," dealt with in the pre-Linnean or Gronovian style, without a specific name, though clearly distinguished by the synonymy, the characters, and various observations: the first as a lobster, the second as a crayfish. The synonymy of the first in an unbroken column reiterates the name *Astacus* from a long line of authors: *Astacus*, *Astacus*, *Asturus*, *Astacus*, *Astacus verus*, *Astacus marinus communis*, and then *Astacus marinus* five times over. There is a touching appeal against future misnomers in that *Astacus verus* of Aldrovandi. The reason for assigning *Astacus* to Leach rather than to one of his predecessors is obvious. The earlier science grouped under it not only lobsters and crayfishes, but many incongruous forms. For example, out of the 13 species which Gronovius brings together, the three which he figures correspond apparently to *Palaemon faustinus* de Saussure, *Atya scabra* Leach, and *Corophium volutator* Pallas, two prawns and an amphipod. Fabricius, though he decently begins with *Astacus marinus*, has an equally miscellaneous group. Leach, in 1814, began a more reasonable delimitation. In strictness, no doubt, the name of the lobster's genus should be given as *Astacus* (Fabricius, 1775), Leach, 1814, s. r.; the conciser form which I have used will, in an unpretentious manual, for its brevity's sake, pass muster with all but professors.

One other correction of the history of Crustacea is proffered by Professor Bell. He says "'*Potamobia*, Leach, 1819' (p. 207), should read *Potamobius*, Samouelle, 1819 [preocc. by Leach]." While busy over his Gronovius, he has failed to observe my own correction of *Potamobia* into *Potamobius*, made with acknowledgments to Miss Rathbun on page 40 of 'Natural Science' for last July. The rest of his correction is doubly wrong. Neither was Samouelle the parent of *Potamobius*, nor was that name in 1819 preoccupied by Leach or anyone else. Samouelle, in the 'Entomologist's Useful Compendium,' 1819, shows by acknowledgments in the Dedication, the Preface, and the body of the work that the account which it contains of the Crustacea is simply due to

Dr. Leach. It would be just as reasonable to write *Astacus*, Brewster, 1814, or to assign any other genera established in the article "Crustaceology" to the editor of the 'Encyclopædia,' as it would be to follow Professor Bell in ascribing "Genus 27. *Potamobius*, Leach's MSS.," to Samouelle, the editor of the 'Compendium' in which it first appears. It is quite a misconception to suppose that *Potamobius* was preoccupied. In 1818 Dr. Leach had given the name *Potamobie* in a list of crustacean genera, but the name being given only in French is not of any scientific importance, and if it were, it is not *Potamobius*; and if it were *Potamobius*, it is unaccompanied by any description, and therefore, as Professor Herrick had already explained in 1895, it is a *nomen nudum*. It does not count; it can neither do good nor harm; it does not preoccupy.

We are told in a fine phrase that "zoologists at large" between 1823 and 1837 were content to accept the opinion of Desmarest on the subject of *Astacus*. Perhaps they were, but it is difficult to see what that has to do with the matter in hand. Zoologists at large are a careless lot. Desmarest both in 1825 and 1830 gives *Astacus marinus*, the lobster, precedence over *Astacus fluvialilis*, the crayfish. He accepts Leach's genus *Nephrops*, and would probably have accepted Leach's *Potamobius*, had he ever heard of it. From his silence on the point it may be inferred that he never had. It was he, no doubt, who by incautious language misled Professor Bell into supposing that the generic name *Astacus* was invented by Gronovius. Professor Bell in turn makes the insidious suggestion that some one should invent a name to replace *Potamobius*. It is dreadful to think that before this answer can appear someone may have already done it, tempted, like Herostratus, who burned down the Ephesian temple, by the grandeur of the infamy, for we are told that "the inventor will throw into confusion not only carcinological literature, but every text-book in every language under the sun." How I tremble for those poor dear text-books, induced, perhaps, to change a name or two after peacefully copying one another for half a century, or to alter a sentence in the tenth edition of a stereotyped volume! It would wring tears of anguish from the stoniest heart. Even some museum labels may have been hastily torn up, rewritten, or reprinted, only to be once more cancelled. But I forbear to pursue the harrowing theme. In assigning the generic name *Astacus* to the lobster, and *Potamobius* to the crayfish, my fortunate part has been to maintain the authority of two men eminently distinguished in connexion with the British Museum, Dr. William Elford Leach and Mr. Adam White. The latter upholds the names established by his great predecessor, both in his 'List of the British Crustacea in the British Museum,' published by order of the trustees in 1850, and in his own 'Popular History' of the same group published in 1857. I do not ask that *esprit de corps* should consecrate error, but when the truth happens to be the heritage of one's own household, it seems a mistaken policy to turn it out of doors.

Tunbridge Wells,
Dec. 21, 1896.

Note on some Sponges from the Auckland Islands.

By Prof. R. VON LENDENFELD.

Since comparatively little is known of the littoral fauna in higher southern latitudes, I was very glad to find among the shallow-water sponges sent to me by my late friend Baron Mueller, of Melbourne, a number of specimens, belonging to five different species, from the Auckland Islands.

These islands are situated in lat. 50° 30' S. and long. 166° E., about 450 km. south of New Zealand. The sponges from that locality in Mueller's collection are: 1. *Antherochalina concentrica*, 2. *Ceraochalina multiformis* var. *dura*, 3. *Euchalinopsis* (*Chalina*) *oculata*, 4. *Thorecta exemplum* var. *tertia*, and 5. *Spongelia elastica* var. *lobosa*. 2, 3, and 4 have previously been found in New Zealand; 1, 4, and 5 in Australia; and 3, 4, and 5 also elsewhere. New forms, not hitherto obtained from other localities, were not among these Auckland-Island sponges.

On the Sexes of Charaxes mixtus, Rothschild.

By A. G. BUTLER, Ph.D. &c.

In my late revision of the genus *Charaxes* (Journ. Linn. Soc., Zool. vol. xxv. p. 377) I placed *C. mixtus*, Roths., as a variety of *C. tiridates*, remarking:—"There can be no doubt, I think, that the prominence of the white centres to the blue spots, unless proved to be peculiar to one locality only, can hardly indicate even a distinct race. Mr. Rothschild insists that the true female of *C. mixtus* resembles the male!"

Recently Mr. Rothschild brought the type of his female *C. mixtus* to the Museum, but, unhappily, I was away ill. Mr. Heron, however, made a careful coloured drawing of it, which, on my return, he showed me. Directly I looked at it I was convinced, by the form of the wings alone, that it was a female, though with the colouring of a male! * Mr. Rothschild was therefore quite correct as to the sex of his type of *C. mixtus* ♀. Whether the latter is more than a dimorphic form of *C. tiridates* can only be satisfactorily decided by those who have an opportunity of studying it in life and breeding it; but there are several other species of *Charaxes* which have two well-defined forms of females, whilst the males differ in much the same way as those of *C. mixtus* and *C. tiridates* †. I hardly think *C. mixtus* can be a seasonal form, on account of its great rarity, whilst *C. tiridates* is one of the most abundant of the blue *Charaxes* of West Africa; but I think it may be a rare dimorphic form of *C. tiridates* ♀. The differences in the male alone would not strike anybody as of great importance—they are less than one notes between the acknowledged varieties of many species; nevertheless, if they should be proved to be constant, I would be the last to refuse to recognize their importance, for I am well aware that characters which in one group of butterflies are valueless are quite constant and reliable in another.

* An extremely surprising thing in this group, where the female differences are usually very pronounced.

† *C. Hollandii* and *C. Dewitzi*.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SIXTH SERIES.]

No. 110. FEBRUARY 1897.

XI.—On a Collection of Homoptera made in Southern Africa. By W. L. DISTANT.

DURING a recent sojourn in the Transvaal and other parts of South Africa, as a result of my own collecting and the kind assistance of friends in more remote localities, I acquired a considerable number of different species belonging to the Cicadidæ and other Homoptera. From Mr. Guy Marshall, in Mashunaland, I received nine species of the first, captured within a radius of eight square miles near Gadzima, on the Middle Umfuli River. As no species have hitherto been recorded from this portion of Rhodesia, I give an enumeration of the same :—

Fam. Cicadidæ.

Pecilopsaltria leopardina, Dist.

— *horizontalis*, Karsch.

— *bombifrons*, Karsch.

— *Marshalli*, sp. n.

Platypleura Rutherfordi, Dist.

Platypleura centralis, sp. n.

— *brevis*, Walk.

Tibicen nigricans, Stål.

Monomatapa insignis, gen. et sp. n.

It is interesting to note that *Platypleura Rutherfordi*, which I originally received and described from the Calabar district of Western Africa, extends its range across the continent to Mashunaland.

Further north from Nyassaland, at Zomba and Fort Johnston, I received from my friend Dr. Percy Rendall four

species, two of which are also included in the above list. They are as follows :—

Pæcilopsaltria leopardina, Dist. *Platypleura brevis*, Walk.
 — *polydorus*, Walk. — *divisa*, Germ.

After my first visit to the Transvaal, I was only able to record the names of three species from that region. I now enumerate thirteen species :—

Pæcilopsaltria furva, sp. n. Waterberg.
 — *reducta*, Walk. Rustenburg, Waterberg.
Platypleura semiclara, Germ. Barberton.
 — *Haglundii*, Stål. Waterberg.
 — *capensis*, Linn. Middelburg.
 — *divisa*, Germ. Barberton, Rustenburg, Pretoria.
 — *hirta*, Karsch. Barberton, Lydenburg, Rustenburg.
Tibicen nigricans, Stål. Pretoria.
 — *carinatus*, Thunb. Pretoria.
 — *undulatus*, Thunb. Pretoria.
Callipsaltria longula, Stål. Rustenburg, Pretoria.
 — *elongata*, Stål. Rustenburg.
Psilotympana, sp.? Rustenburg.

For the Barberton specimens I am again indebted to Dr. Percy Rendall during his stay in that district.

At Delagoa Bay I acquired *Pæcilopsaltria reducta*, Walk., and *P. polydorus*, Walk. The scarce and handsome *Melampusalta violacea*, Linn., I find is to be procured on the banks of the Caledon River in Cape Colony. *Pæcilopsaltria Peringueyi*, which I originally described from Damara Land, is to be found as far south and east as Griqualand at least, for I now possess a specimen from Barkly West.

Pæcilopsaltria furva, sp. n.

Head and pronotum ochraceous and moderately pilose; mesonotum and abdomen above black. Head with the central longitudinal and transverse carinæ to face, very broad lateral margins to front enclosing an ochraceous apical spot, a basal spot enclosing ocelli, between which and eyes are some complicated transverse fasciæ, black. Pronotum with a central fascia, widely broadened on anterior and posterior margins; the incisures and extreme sublateral margins black. Mesonotum black, with two obconical linear spots, united at base on anterior margin; two J-shaped fasciæ at base, and anterior half of lateral margins ochraceous; basal cruciform elevation ochraceous, with a central spot and anterior angles black. Abdomen with the posterior segmental margins above narrowly ochraceous. Body beneath with legs and opercula

ochraceous; sternum and legs spotted with black, abdominal segments with central transverse fasciæ and lateral marginal spots black.

Tegmina creamy, mottled with fuscous, the venation ochraceous, but becoming piceous towards apex; basal cell black. Wings blackish, a basal streak irregularly ochraceous to about centre, the outer margins broadly pale hyaline, and with a creamy-white spot near centre of costal margin.

Rostrum reaching the posterior coxæ; opercula moderately overlapping at centre.

Long. ♂ 28 millim.; exp. tegm. 76 millim.

Hab. Transvaal; Waterberg District (*Distant*).

This species is allied to both *P. Trimeni* and *P. Peringueyi*, from either of which, apart from other characters, it may be easily distinguished by the position of the white macular markings to the wings.

Pæcilopsaltria Marshalli, sp. n.

Head and pronotum ochraceous. Head with the area of the ocelli, transverse fasciæ between same and eyes, and basal and central fascia to face black; pronotum with a central fascia widely broadened at anterior and posterior margins, the incisures, and the sublateral margins black; mesonotum black, with a large central linear spot, trifid anteriorly and connected with a lateral fascia on each side, ochraceous; cruciform basal elevation ochraceous, with a small central spot, and one near each anterior angle, black. Abdomen above black, with the posterior segmental margins ochraceous. Body beneath blackish or dark castaneous; opercula, posterior abdominal segmental margins, and legs castaneous or ochraceous.

Tegmina creamy and talc-like, base and four very irregular transverse fasciæ, which are connected inwardly and contain some pale spots, especially at the apices of apical areas, piceous; venation ochraceous, becoming piceous towards apex. Wings blackish, apical third and a large subcostal spot within the black area pale hyaline.

Rostrum just passing the posterior coxæ; opercula moderately overlapping at centre.

Long. ♂ & ♀ 15-16 millim.; exp. tegm. 53 millim.

Hab. Mashunaland, Umfili River (*Guy Marshall*: coll. Dist.); banks of the Zambesi (*Fry*, 1893: Cape Town Mus.).

A single female specimen from the Zambesi is much larger than the series I possess from Mashunaland through the kindness of Mr. Marshall. Its dimensions are long. 20 millim., exp. tegm. 63 millim.

Platypleura centralis, sp. n.

Body above ochraceous, with an almost continuous central longitudinal black fascia extending from head to apex of abdomen. Head with a fascia extending between eyes and across base of face and the area of the ocelli, pronotum with the incisures and base of lateral margins, mesonotum with two obconical spots on anterior margin (on each side of which are a small and a much elongated spot) and the frontal area of the basal cruciform elevation black; abdomen with the basal segmental margins black. Body beneath and legs ochraceous, greyishly pilose and more or less spotted with blackish; abdominal segments marked as above.

Tegmina pale, talc-like; the costal membrane, the post-costal area, and the basal cell ochraceous; an elongate costal spot at end of radial area, a spot in basal cell, and the venation (excepting extreme base) black. Wings with the venation ochraceous.

Rostrum long, reaching to quite half the length of the abdomen; opercula well separated at base; lateral pronotal angles prominent, subacute.

Long., ♂ 22, ♀ 24 millim.; exp. tegm. 77 millim.

Hab. Mashunaland, Umfili River (*Guy Marshall*).

Platypleura absimilis, sp. n.

Head and thorax above pale castaneous; area of the ocelli infuscated; legs ochraceous; mesonotum with two central obconical spots on anterior margin, a longer and more obscure spot on each lateral area, and a small spot in front of the anterior angles of the basal cruciform elevation, dark fuscous. Abdomen above black. Head beneath, sternum, legs, and opercula dark ochraceous; abdomen beneath dark castaneous.

Tegmina greyish brown, the venation castaneous, two pale spots in radial area, a trifid spot of the same colour separated by the veins of the upper ulnar areas, and a larger discal and more irregular patch of the same hue extending from near lower end of radial area across bases of lower apical areas; a series of alternating pale and darker marginal spots at apices of apical areas, the outer margin pale hyaline. Wings ochraceous, the venation castaneous, the outer third irregularly dark fuscous, broadest at apex and narrowest towards anal angle.

Rostrum just passing posterior coxæ.

Long. ♂ ♀ 18-22 millim.; exp. tegm. 60-75 millim.

Hab. South Africa, Cape Colony? (*Coll. Dist.; Vienn. Mus.*).

This species may at once be distinguished from *P. plumosa* and *P. deusta* by the absence of the central black fascia to the pronotum. It is allied to *P. plumosa* by the wide and relatively short pronotum, but differs by the broader tegmina, shorter abdomen, different markings of the tegmina, &c.

MONOMATAPA, gen. nov.

Body short, robust, widest about centre of abdomen. Head broad, at outer margins of eyes a little wider than mesonotum; ocelli about twice the distance from eyes as from each other; face broad, not prominently tumid, longitudinal sulcation narrow, transverse ridges prominent. Metanotum concavely excavated posteriorly; basal segment of abdomen subacutely and convexly produced anteriorly. Opercula rather large, directed inwardly, much widened posteriorly. Tympana completely exposed. Tegmina with the basal cell longer than broad and the ulnar veins at end of same widely separated; interior ulnar area a little narrower at base than apex; apical areas eight.

Monomatapa, which, by the exposed tympana, belongs to the division Tibiceninae, has a somewhat superficial resemblance to the genus *Tympanoterpes*.

Monomatapa insignis, sp. n.

Body above black; eyes, pronotum (excluding central longitudinal fascia), and the exposed tympana dark castaneous; abdomen rather thickly greyishly pilose; body beneath and legs black; tibiae and tarsi more or less castaneous or ochraceous; opercula ochraceous; lateral areas of the body and opercula thickly greyishly pilose.

Tegmina and wings pale hyaline; the first with the venation blackish, the base narrowly, basal cell, and outer edge of costal membrane ochraceous. Wings with the venation blackish, the base ochraceous, with a darker spot on the abdominal area.

Rostrum short, about reaching the intermediate coxae; opercula extending over the basal segment of the abdomen, obliquely directed inwardly, widened posteriorly.

Long. ♂ 27 millim.; exp. tegm. 80 millim.

Hab. Mashunaland, Umfili River (*Guy Marshall*).

Fam. Fulgoridae.

Genus PYROPS.

Of the seven recorded South-African* species I was able

* I include East Africa in the "South African" faunistic region, as recently well proposed by Mr. W. L. Sclater, now directing the South-African Museum.

to bring home five. Of the others, *P. marginatus*, Westw., seems to be confined to some portions of the Cape Colony and *P. turritus*, Gerst., was received from Dar-es-Salaam. *Pyrops* is a tropical and subtropical genus, only occurring in the Transvaal (as far as my experience goes) in the stretch of warm forest country which extends from Delagoa Bay to Durban.

Nyassaland.

P. pustulosus, Gerst. Zomba (Dr. P. Rendall).
P. tenebrosus, Fabr. " "

Mashunaland.

P. claviceps, Karsch. Umfili River (Guy Marshall).

Transvaal.

P. intricatus, Walk. Barberton (Dr. P. Rendall).

Natal.

P. natalensis, Dist. Durban (Distant).

Two of these species—*P. claviceps* and *P. tenebrosus*—range across the continent, being found on the west coast.

Subfam. *EURYBRACHYDINÆ*.

Paropioxys bellus, sp. n.

Body ochraceous; head with four basal black spots between the eyes; pronotum with six spots (two central placed transversely and two on each side obliquely); mesonotum with five spots, also black: legs reddish; apices of the femora, annulations to the anterior and intermediate tibiae, and the tarsi black.

Tegmina pale greenish, the basal half with some large ochraceous spots, followed by an obscure dull ochraceous transverse fascia, and with the following bright shining black spots, viz.:—one at base, four along costal margin, and some twenty-five or more on apical area. Wings pale greenish white, the apex slightly ochraceous, and containing about twelve small black spots.

Long., excl. tegm., 13 millim.; exp. tegm. 40 millim.

Hab. Nyassaland, Zomba (Dr. Percy Rendall).

A species somewhat allied to *P. gloriosus*, Karsch.

Fam. Cercopidae.

Genus LOCRIIS.

Locris Rendalli, sp. n.

Head and pronotum black, the last with the anterior and lateral margins and two transverse spots on disk ochraceous. Abdomen above sanguineous, slightly fuscous at lateral margins. Body beneath and legs blackish; eyes and lateral margins of prosternum ochraceous; posterior tibiae, excluding bases and apices, pale sanguineous.

Tegmina blackish; basal streaks, two transverse fasciae, and a subapical patch ochraceous. Wings pale fuscous, semihyaline, the outer apical margin darker; extreme base narrowly sanguineous.

Long. 9 millim.; exp. tegm. 21 millim.

Hab. Nyassaland, Zomba (*Dr. Percy Rendall*).

This species, by the colour and markings of the tegmina, is closely allied to the West-African *L. maculata*, Fabr., but differs from all the varietal forms of that species by the ochraceous margins to the pronotum and by the absence of the ochraceous frontal margins to the head. The pronotum is also broader.

Why these two species, or geographical forms of one species as they may some day be more correctly identified, should on the east and west sides of the continent have developed a difference in the structure and markings of the pronotum is one of the still unsolved problems in specific evolution, and unexplained by any of the colour theories now proposed in speculative entomology.

Locris Junoti, sp. n.

Head, pronotum, scutellum, basal third and apical margin of tegmina, face and legs sanguineous; tegmina (excluding base and apical margin) pale creamy ochraceous, mottled with pale fuscous, the apical third distinctly darker ochraceous, containing a dark fuscous spot. Eyes, ocelli, two spots on anterior area of pronotum, sternum, abdomen beneath, and bases of femora piceous.

Long., incl. tegm., 8 millim.

Hab. Delagoa Bay (*Junot*).

This species, by its singular coloration, is nearest allied to *L. concinna*, Dist., and it is peculiar that we must cross the continent to Damaraland to find its nearest specific ally. Of course, collectors may subsequently find the two species less

estranged, but according to present knowledge they differ materially.

Of other species of *Locris* in my collection I may mention:—

Nyassaland.

L. areata, Walk. Fort Johnson (*Dr. Percy Rendall*).

Mashunaland.

L. arithmetica, Walk. Salisbury (*Guy Marshall*).

Transvaal.

L. arithmetica, Walk. Pretoria (*Distant*); Zoutpansberg (*Kaesner*).

L. areata, Walk. Barberton (*Dr. P. Rendall*).

L. incarnata, Walk. Zoutpansberg (*Distant*); Rustenburg (*Distant*).

L. sanguinipes, Walk. Pretoria (*Distant*).

Delagoa Bay.

L. areata, Walk. Lourenco Marques (*Junot*).

L. Junoti, sp. n. " " "

Natal.

L. areata, Walk. Durban (*Distant*).

L. transversa, Thunb. Isipingo, Durban (*Guy Marshall*).

Genus TOMASPIS.

Tomaspis Monteironis, Dist. Trans. Ent. Soc. 1878, p. 176;
Aid Ident. Ins. t. cxlviii. fig. 4.

Tomaspis conspicua, Dist. Trans. Ent. Soc. 1878, p. 148;
Aid Ident. Ins. t. cxlviii. fig. 2.

I have now acquired an intermediate form which connects the above supposed species together:—

Var. *a*.—Tegmina black; unspotted.

T. Monteironis, Dist. *suprà*.

Hab. Delagoa Bay (*Monteiro, Junot, Distant*).

Var. *b*.—Tegmina with a small central transverse sanguineous spot.

Hab. Delagoa Bay (*Junot*).

Var. *c*.—Tegmina with a very large central sanguineous spot.

T. conspicua, Dist. *suprà*.

Hab. Nyassaland; Mashunaland, Gadzina (*Guy Marshall*).

Tomaspis appears to be a tropical and subtropical genus only. I never met with it in any of my collecting expeditions in the Transvaal. Delagoa Bay at present is its recorded southern limit; but probably it may be found in Durban, where much is still to be done, apart from Lepidoptera, and where other species only previously known in Mozambique have been discovered.

XII.—*A Contribution to the Biology of the Social Wasps of Brazil.* By H. VON IHERING*.

It is nowadays very difficult and—particularly in cases where special attention has to be paid* to the literature of extra-European countries—barely possible to guarantee full cognizance of all that has been written upon a biological theme. Consequently something may have escaped my notice even in respect of the subject about to be discussed, although, on the whole, the statements in the following paper will probably be new to my scientific colleagues.

On studying the various special memoirs or the descriptions in handbooks &c., we invariably find that the account of the life of the social wasps is altogether European, based exclusively upon the facts to be observed in Europe and in the holarctic region in general. In order to make myself intelligible upon this point, let me briefly refer to what is generally known. The social life of the European wasps is eminently adapted to the harsh climate of Europe. There are in Europe, so far as is at present known, no wasp-communities that hibernate regularly, though even as to this I must nevertheless be allowed to entertain doubts with regard to the extreme south of Europe, especially with reference to *Polistes*. In autumn the community separates, the workers and males perish, while the fertilized females alone hibernate and commence the foundation of a new colony in the spring.

How utterly different is the case here! Even *Polistes*, the single genus of social wasps common to Europe and Brazil, behaves somewhat differently. Here, too, it is the rule for the community to be dissolved in winter; but nevertheless in July, therefore in mid-winter, we meet with colonies of *Polistes versicolor*, Fabr., still surviving and continuing to

* Translated by E. E. Austen from the 'Zoologischer Anzeiger,' Bd. xix. no. 516 (November 2, 1896), pp. 449-453.

exist in an almost inactive condition with a diminished number of individuals: it is true that this is not the case in Rio Grande do Sul, though it certainly occurs in São Paulo. In Rio Grande do Sul it was a very remarkable sight to watch *Polistes* (females and workers) at the commencement of winter seeking out human habitations, in order to search for suitable hiding-places in which to hibernate. Even thus many perish, but in spring I have repeatedly seen on freshly-begun nests a female carrying on building-operations already in company with workers. Whether in such cases remnants of a colony have come together to build a new home, or whether the hibernated female has accepted the assistance of chosen hibernated workers, I am unable to say.

In the case of *Polybia* and its allies the influence of winter is much less noticeable than in *Polistes*. *Polybia scutellaris*, White, still hibernates even in Rio Grande do Sul. The very solid prickly envelope of the large nest doubtless affords a good protection against the weather. Moreover this very species collects honey freely and in relatively large quantities. It is amassed in pretty irregular fashion in the lower cells, especially at the edge of the combs, but it nevertheless induces boys, and also adults with a *penchant* for sweets, to destroy the nest. I have seen many nests inhabited for a long period. Here in S. Paulo, too, I have made the same observation upon the *paulista* variety of this wasp, which will be referred to later on. It is consequently not a matter for surprise when one notices these wasps again in the open during exceptionally fine weather in the middle of winter.

Another new observation upon *Polybia* is the fact that it swarms. Whether a fertilized female *Polybia* is ever capable of commencing a nest alone, as is, indeed, still probable, is a point which future study must decide: at any rate, it is not the rule for it to do so. I have very often observed the commencement of new nests of *Polybia*; the task was always undertaken by a swarm. A closely packed cluster of *Polybia scutellaris*, of the size of a large orange or larger, settles on some spot or other, often by no means a suitable one, without, however, at once deciding to begin to build.

Not infrequently is the spot changed several times before work commences. Then, however, it proceeds astonishingly fast, so that in from two to three weeks a nest is built containing from four to five combs. At the same time, however, the whole of the attention is in the first place devoted exclusively to nest-building, so that one finds charming new nests with from three to four combs in which there is not yet a single cell that has received even an egg. In the case of

Polybia scutellaris it is not easy to discover the males and females. How many times have I not examined the entire contents of the nest without finding any! In Rio Grande do Sul I several times found females (twelve to fourteen) in the nest of *P. scutellaris*, as well as males in considerably larger numbers. The females are not or scarcely larger than the workers; but the wings, which show a slight brownish sheen, afford a better means of recognition.

Moreover in this respect the nests exhibit very different conditions, according to the number of the workers. I once examined a rather small nest with only three combs, which nevertheless already contained brood. The number of the workers in this case amounted to only 126. An observation may here also be alluded to which is opposed to what was seen by Janet in connexion with *Vespa*. The insects brought in by *Polybia scutellaris* are never chewed up into food-balls, but are carried in whole, sometimes more, sometimes less mutilated, though the wings are always removed. Termites and house-flies constitute the principal quarry, though the latter are seldom captured alive, but are usually carried off when dead or in a half-dead condition.

In the case also of *Polybia sericea*, Oliv., I have frequently seen a new nest commenced in a precisely similar fashion. Once upon a fresh spring morning I observed a swarm that evidently had hibernated without a nest. The wasps, still quite stiff, crawled out from a low bush. The nest had probably been destroyed by inclement weather or by enemies. Among the latter I allude especially to the large "Lagarto" lizard (*Tupinambis teguixin*, L.), which is particularly dangerous to the nests of *Nectarinia mellifica*, Sauss., which are always placed pretty low down and are rich in honey. With reference to this it may be remarked that I also met with honey in the nests of *Polybia sericea*.

In the case of the above-named *Nectarinia* I once observed a nest in autumn which contained about an equal number of males and workers. A large proportion of the latter contained eggs, but one had to regard them as workers on account of the rudimentary receptaculum seminis. It is probable that here also drones are produced from the eggs of workers, and this very circumstance would afford an explanation of the exceptionally large number in the nest referred to.

In connexion with the differences which have been described in the mode of life of the communities are those which we find in the structure of the nests. In this respect, as regards variety and finish of the edifices, no other region of the earth can compare with Brazil; for out of the whole of the wasps

of the Old-World *Vespa* is the only one that builds a complicated nest surrounded by an envelope: all the rest in their style of architecture more or less resemble *Polistes*. In eastern South America, on the other hand, what wealth and variety of structural types, what elegance and marvellous artistic skill! While referring the reader to Saussure's classical monograph, I would here draw attention only to what is new among my observations.

It is well-known that the nest of *Mischocyttarus* is very similar in construction to that of *Polistes*, differing only in the longer central pedicle; but it was to me an altogether surprising and unexpected discovery to find that there are also species of *Polybia* whose nests are indistinguishable from those of *Polistes*. The species in question are *Polybia vicina*, Sauss., and *P. ignobilis*, Halid. All the other members of the genus, even *Polybia atra*, Sauss., build nests with concentric envelopes, so that when the nest is enlarged the last and most recent envelope is always used as a base for the new combs. It may appear at first sight to be a matter of no special importance that within the limits of a large genus a portion of the species should differ in the structure of their nests; but the subject is nevertheless a much more complicated one, since with these differences others in the mode of life of the communities are directly connected. In the one group we have the foundation by a fertilized female of what is usually a community existing for one year, in the other long-lived colonies founded by the formation of swarms, as in the case of bees.

I am bound to admit that I regard these species of *Polybia* which live after the manner of *Polistes* as representing a distinct genus. It is probably not customary to utilize biological considerations for the foundation of genera, but perhaps even in this case closer investigation will demonstrate the morphological basis for the separation inferred on biological grounds.

According to their mode of life, or, say, the formation of communities, the social wasps of South America may therefore be divided into two groups:—

(1) **Summer communities**, or such as last for one year, founded in spring by fertilized females which have hibernated: *Polistes*, *Mischocyttarus*, and *Pseudopolybia* (a name which I adopt for *Polybia*-like wasps that construct nests after the manner of *Polistes*).

(2) **Perennial communities**, founded by swarms after the fashion of bee-colonies: *Polybia*, *Apoica*, *Tatua*, *Synocca*, *Chartergus*, *Nectarinia*.

The Old-World genera not mentioned in this list all belong to the first group. Divers species of *Polybia* are known from tropical Asia, but I know nothing about their life-history.

In conclusion, I would add a remark as to the genital apparatus, in which the closest agreement exists in all the genera of social wasps that I have investigated. The number of testicular tubes is always the same as that of those of the ovary, and this number is invariably three on each side, as is also the case in the solitary wasps examined.

In the strongest contrast to this condition, that I have proved to exist in *Polistes*, *Mischocyttarus*, *Nectarinia*, *Polybia*, and *Chartergus*, is what we have recently learnt from Bordas *, in amends for previous inexact statements. According to this author the number of testicular tubes in *Vespa* is from two hundred to three hundred. How large the number of the ovarian tubes really is (earlier accounts speak of six or more) must remain uncertain in default of fresh examination. *Vespa* consequently presents a strong contrast to the rest of the social wasps, and in this respect stands in the same relation to them as that in which the Apidæ stand to the Andrenidæ or Megachilidæ, since in the former there are three hundred testicular tubes, in the latter three. It appears that for the Hymenoptera this number *three* represents the primitive condition, and therefore *Apis* and *Vespa* are aberrant types. As to the anatomy of the social wasps of Africa and India we as yet know nothing. In these cases the work accomplished for the South-American genera has still to be done. Then, and not until then, will it be possible to ascertain the relation of *Belonogaster*, *Icaria*, &c. to the rest of the Vespidæ. Probably it will then be found that *Vespa* cannot be included in the same family as the other genera of social wasps. The true Vespidæ, including *Vespa*, would then have a very large number of testicular tubes; the rest of the Polybiidæ would exhibit three of these structures in each testis. It is probable that upon closer investigation yet other differences will be added in other organs or in the larvæ, and to point out the necessity for such studies is precisely the object of this exposition.

São Paulo, Brazil,
July 23, 1896.

* Bordas, "Appareil genital mâle des Hyménoptères," *Annales des Sciences natur.* vii. sér. tom. xx., 1895.

XIII.—*Contributions from the New Mexico Biological Station.*

—No. IV. *Diptera from the Sacramento and White Mountains, in Southern New Mexico.* I. By C. H. TYLER TOWNSEND.

THE Sacramento Mountain and White Mountains are situated in south-central New Mexico, in north-eastern Doña Ana, and western Lincoln counties. The Mescalero Apache Indian Reservation is located within the limits of the northern portion of the range. White Mountain stands at the north-western end of the Sacramentos, and really forms a part of the range. It is the highest point, being in the neighbourhood of 11,000 feet. Military maps give its elevation as 11,092 feet. The Rio Ruidoso heads on its eastern slopes, as do also Eagle Creek and the two forks of the Rio Bonito. The most of the Ruidoso collecting was done some miles below its head, from just above Dowling's Mill to a point 4 miles west, the altitude being about 6500 to 6600 feet. Dowling's Mill is given by military maps as 6455 feet. Austen's Ranch, on the north fork of the Rio Bonito, is about 6400 feet; it is situated some 12 miles up this fork west from Fort Stanton (now recently abandoned as a military post), which latter is on the Rio Bonito just below the junction of the two forks, at an altitude of 6151 feet.

The Mescalero Agency, or post-office of Mescalero, being the only settlement on the reservation and the headquarters of the Indian Agent, is situated in the head of the main valley of the Rio Tularosa, on the Ruidoso road, some 7 miles below or south of the top of the divide. It is halfway between Tularosa town and the Upper Ruidoso store, it being 18 miles from the Agency to either place. The altitude of the divide just mentioned is about 7000 feet. White Mountain, it is understood, with the Rio Ruidoso and Rio Bonito, lies on the other side of this divide, to the north and north-west of it. The altitude of the Agency is 6340 feet; that of Tularosa town, situated on the plain at the western base of the mountains and near the mouth of the Rio Tularosa valley, is 4140 feet. These and several other elevations, including White Mountain and Dowling's Mill, with other valuable data, were kindly furnished me by Lieutenant V. E. Stottler, U.S.A., who has charge of the Mescalero reservation, and to whom I wish here to express my thanks for many courtesies.

The road from Tularosa to the Agency follows up the

valley of the Rio Tularosa, which is a beautiful clear stream furnishing water for irrigating the small patches of the Indians and the several small ranches situated in the valleys of the cañon. The best collecting of all was done on the flowers of the rankly growing *Bigelovia graveolens*, var. *glabrata*, in October, along this road, which usually follows the course of the stream up closely here. This collecting was done in the upper extent of the long stretch of *Bigelovia* patches, the altitude being from about 5700 to 6200 feet. An account of this is given under the head of *Dejeania rutilioides*. These patches of *Bigelovia* extend all the way down the valley, in close proximity to the stream, with hardly a break, from Blazer's Mill, which is less than a mile below the Agency, elevation about 6200 feet, to the halfway point to Tularosa, where the road crosses the stream, elevation about 5200 feet, a distance of 8 miles. The plants are often immense, with heavy woody trunks and branches, and some stand as high as 8 or 9 feet. They are in the height of bloom about the 1st of October. The October collecting on the Rio Ruidoso was done on flowers of *Senecio Douglasii*; on the Rio Bonito the October collecting was done on *Aster lævis*, which grew rankly in large patches bearing profuse bloom.

My thanks are due to Professor E. O. Wooton for the determinations of the plants. Professor Wooton writes me that his material of the *Rhus* mentioned in this paper agrees more nearly with the descriptions of *R. glabra* than with anything else; but he adds that he had no authentically named *glabra* material by him for comparison. Prof. J. D. Tinsley, independently of Professor Wooton's determinations, also sent me the names of five of the plants, and considers the *Rhus* to be *R. glabra*.

A portion of the Diptera treated in this paper was collected by Professor Wooton in June and July, 1895, while on a botanical trip on the Ruidoso and eastern slopes of White Mountain. Not only was record kept on his trip of the flowers on which the Diptera were obtained, but care was taken to secure approximately by aneroid the elevations of the principal places where collecting was done, which information is very valuable. All material aside from the above was collected by the writer in October 1895.

All elevations given with the word "about" are estimates made by the writer from points in the vicinity whose elevations are known. They have been carefully estimated, and can be taken as very nearly correct.

Stratiomyidæ.**1. *Microchrysa*, sp. ?**

One female, Rio Ruidoso ; on foliage, July 3 (*Wooton*). About 6400 feet (this locality and elevation always mean that Professor Wooton omitted to give elevation and exact locality, which are taken to be just below Dowling's Mill).

Length 6 millim.

Front nearly as wide as eyes. Arista terminal. Abdomen very flattened, narrowed at base, subquadrangular, wider than thorax, rounded at each end, wholly shining green. Thorax shining green with strong purple reflection.

Syrphidæ.**2. *Pipiza occidentalis*, sp. n.**

One female, Rio Ruidoso ; on flowers of *Rhus glabra*, L., July 10. Four miles west of Dowling's Mill, 6600 feet (*Wooton*).

Length 5 millim.

Differs from Williston's description of *P. pulchella* only in the following particulars :—Abdomen less than twice as long as thorax. There is no "slender deep groove" before margin of scutellum. Legs black ; tips of all femora, bases of anterior tibiæ, basal two joints of front and middle tarsi, and tips of hind metatarsi with next tarsal joint yellowish or reddish yellow. Hind metatarsi not more swollen than other tarsal joints. The apical cross-vein is subsinuate, being abruptly straight at its base, but curved on its final portion ; it forms a right angle with fourth vein. The auxiliary vein terminates hardly beyond anterior cross-vein. Closely like *pulchella* in all other points.

This species is very distinct from the two described by Williston in the Biol. Centr.-Am., Dipt. iii. pp. 6-7.

Mr. W. A. Snow identifies (Kans. Univ. Quart. iii. p. 227) three specimens of *Pipiza* from the Magdalena Mts., N. M., as *P. pistica*, Will. The present species is distinct from *pistica* in the pile of eyes being black (except, perhaps, that on upper portions next front), and the hind metatarsi not being thickened.

3. *Baccha lemur*, O. S.

One female, Rio Ruidoso, 4 miles west of Dowling's Mill, 6600 feet, July 10. On flowers of sumac, *Rhus glabra*, L. (*Wooton*).

Length 10 millim.

Face of a yellowish-gray ground-colour, facial stripe deep buff-yellow. Abdominal cross-bands reddish yellow. Legs pale yellow; tarsi brownish, hind femora and tibiae with a pale brownish ring before tip.

4. *Volucella Anna*, Will.

One male, Rio Ruidoso, about 6400 feet, June 30. On flowers of *Philadelphus serpyllifolius* *, Gray (Wootton).

The third joint of antennae is rather deeply excised on front edge.

5. *Volucella Comstocki*, Will.

One male, Rio Tularosa, below Blazer's Mill, about 6000 feet (this locality and elevation, wherever given, mean somewhere between the 5700 and 6200 feet elevations). On flowers of *Bigelovia graveolens*, var. *glabrata*, Oct. 20.

Length 9½ millim.

6. *Volucella Victoria*, Will.

One female, Rio Tularosa, below Blazer's Mill, about 6000 feet. On flowers of *Bigelovia graveolens*, var. *glabrata*, Oct. 20.

Length 10 millim.

Antennae are scarcely darker coloured than face and front. Scutellum, instead of being "deep pitchy black," as in Williston's description (Syn. p. 145), is wholly chestnut above, as in *V. Comstocki*. All the veins of wings are faintly bordered with yellowish. The marginal cell is closed, but not petiolate.

7. *Eristalis tricolor*, Jaenn.

One female, Rio Bonito, Austen's Ranch in the Bonito Park, about 6400 feet. On flowers of *Aster laevis*, L., Oct. 17.

This is the first record of this species being found in New Mexico, and even in the United States. I took it the same year (1895) abundantly on the lower Rio Grande at Brownsville, Texas, as will appear in a paper soon to be published on the Diptera of that region. The present specimen has the black more widened out posteriorly on abdominal segments

* Prof. J. D. Tinsley identifies this species as *Philadelphus macrophyllus*. This determination has later been verified by Mr. Frederick V. Coville, of the U.S. Department of Agriculture.—C. H. T. T.

than in Brownsville and Lower Californian specimens. It is evidently the same species, although the more prevailing black of posterior half of abdomen gives it a slightly different facies. It may, perhaps, represent a northern race of this tropical species.

Note.—Mr. W. A. Snow, in his "Supplementary List of North-American Syrphidæ" (Kans. Univ. Quart.), has followed Giglio-Tos in considering *E. tricolor*, Jaenn., a synonym of *E. pusillus*, Meq. I fail to see anything in Macquart's description that would lead me to believe in this synonymy.

8. *Chrysochlamys cræsus*, O. S.

One female, Rio Ruidoso, 4 miles west of Dowling's Mill, 6600 feet. On flowers of *Rhus glabra*, L., July 10 (Wooton). Length 9 millim.

Legs wholly saturate reddish yellow, only the coxæ fuscous.

9. *Milesia bella*, sp. n.

Two specimens (male and female), Rio Ruidoso, 4 miles west of Dowling's Mill, 6600 feet. On flowers of *Rhus glabra*, L., July 10 (Wooton).

Length of male 15 millim., of female hardly 16 millim.

Differs from Williston's description of *M. ornata* (Syn. p. 255) as follows:—Male with triangular brown spot at base of antennæ above; female with posterior orbits more cinereous than yellow, though this character is doubtless more or less variable. The anterior two yellow fasciæ of prothoracic dorsum roughly forming a yellow transverse H-shaped marking, cleft through the middle of the bar by a rather wide black vitta; the suboval humeral spot helps to form this, but does not coalesce with it, being separated by a narrow neck of black from the rest of the half of the marking of that side, which is L-shaped on the right side and the reverse on the left. Pleuræ, without yellow on anterior border from humeri to base of anterior coxæ, black. Second abdominal segment with a yellow cross-band interrupted in middle, anterior border of each half running obliquely outward and forward, hind border sinuate; a transversely elongate yellowish spot behind these on each side on posterior corner of segment. Third and fourth segments in male with an anterior uninterrupted yellow cross-band, widened at ends; the third segment with a posterior brownish-yellow band of same width not widened at ends, this band on fourth segment being twice as broad as on third. In females the yellow (anterior)

band of third segment is narrowly interrupted. Pile of abdomen yellow on the bright yellow markings, black on the black and brownish-yellow markings. Legs yellow, the front tibiæ and tarsi of both sexes black or brownish black except extreme bases of tibiæ; the female with a tinge of brownish on uppersides of all the femora and an elongate brown spot on inside of hind tibiæ, the male with latter and with extensive dark brown shading on uppersides of all femora. Hind coxæ in both sexes with a large yellow pollinose spot on outside, and a linear transverse yellow marking above this situated below and in front of the yellow halteres. Wings nearly hyaline, faintly fuscous near tips, faintly yellowish in basal half of submarginal cell and in base of marginal cell, also somewhat along veins at base of wing.

This species is very distinct from Williston's *M. pulchra* from Guatemala.

Conopidæ.

10. *Oncomyia*, sp.

One female, Rio Ruidoso, 6600 feet. On flowers of *Erysimum asperum*, DC., July 3 (Wootton).

It is impossible to say what species this is, as the antennæ are entirely wanting and only a hind femur and a middle femur and tibia remain of the legs.

Length 4 millim.

It differs from Loew's description of *O. loraria* (not taking into account the antennæ or legs so far as they are wanting) as follows:—Four black vittæ on thorax, the outer ones divided by suture so as to resemble two spots, the inner ones more pollinose and less conspicuous. Abdomen soft black, narrow hind margins of first to fourth segments cinereous pollinose, the cinereous on fourth segment with a median line running from it to front border of segment; fifth segment very short, with narrower cinereous hind border; sixth segment wholly cinereous, except an oval median black space on dorsum. Second to fourth segments each with a conspicuous cinereous marking on side, that of second segment being nearly round and situated on posterior corner, that of third being elongate, nearly longitudinal, only very slightly oblique, extending from anterior to posterior border, that of fourth segment being elongate and strongly oblique, reaching from front to hind border. There is also cinereous shading on sides of first segment.

Tachinidæ.

11. *Dejeania rutilioides*, Jaenn.

Twenty-seven specimens (all females), Rio Tularosa, below Blazer's Mill, about 6000 feet. On flowers of *Bigelovia graveolens*, var. *glabrata*, Oct. 20, except two taken Oct. 13.

The fact that they are all females and were taken so late in the year is worthy of remark as bearing on the hibernating habits of this and other Tachinidæ. The nights in the mountains at this date had been cool and frosty for a week or more, the days, however, being warm; and these Tachinids, usually so active, alert, and difficult to catch even with a net, were all taken by simply sweeping with the hand alone, as were also upwards of two hundred other large Tachinids of various genera on this and other flowers. All the October collecting mentioned in this paper was done in this way. The cold nights had dulled the sense of alertness of these flies to such an extent that with care they could be approached to within a few feet before taking flight. As already stated, the *Bigelovia* above mentioned grows rankly for miles along the Tularosa creek, in many places attaining a height of 7 feet and sometimes more, and blooms profusely in October. Its flowers were everywhere covered (Oct. 20) with hundreds of large Tachinids of such genera as *Dejeania*, *Jurinia*, *Saundersia*, *Echinomyia*, &c., as may be judged from the number collected in a few hours by the hand alone.

A word may be said as to the cause of such an abundance of large Tachinids at this season in this locality. The seasons are usually moderately wet in these mountains, but the season of 1895, in October of which year this collecting was done, had been an unusually wet one for New Mexico. As testimony of this, Silver City and Socorro both sustained much damage from cloudbursts in the summer of that year. The wet season stimulated vegetable growth to an unusual degree, and lepidopterous larvæ were abnormally abundant; therefore their Tachinid parasites bred to an unusual extent. Hundreds of these Tachinids were seen that were not taken. In no case were any seen in copulation.

The genus *Dejeania* is said by van der Wulp to have the front tarsi enlarged in the female and the last tarsal joint of male surrounded with long curved bristles. All the above specimens of *rutilioides* have the front tarsi strongly widened; they also have last tarsal joint with curved bristles. Whether the latter are longer and more pronounced in the male of this species I cannot say, as I have no male specimens at hand, but this is doubtless the case.

12. *Dejeania corpulenta*, Wd.

Three males, Rio Ruidoso, 6400-6600 feet. On flowers of *Asclepias speciosa*, Torr. (6400 feet), July 8; on flowers of *Rhus glabra*, L., 4 miles west of Dowling's Mill (6600 feet), July 10; and one on foliage (about 6400 feet), July 3 (Wootton).

One male, Rio Tularosa, below Blazer's Mill, about 6000 feet. On flowers of *Bigelovia graveolens*, var. *glabrata*, Oct. 20.

13. *Dejeania hystriosa*, Will.

Thirty-five specimens, apparently all females. Twenty-nine taken on flowers of *Bigelovia graveolens*, var. *glabrata*, Rio Tularosa, below Blazer's Mill, about 6000 feet, Oct. 20, except two taken Oct. 13. Six taken on flowers of *Senecio Douglasii*, DC., Rio Ruidoso, above Dowling's Mill, about 500 feet, Oct. 15.

Length $10\frac{1}{2}$ - $13\frac{1}{2}$ millim.

This species has the facies of a *Saundersia*, but is distinguished at once from that genus by its well-developed palpi.

14. *Saundersia maculata*, Will.

One male, Rio Tularosa, below Blazer's Mill, about 6000 feet, Oct. 20. On flowers of *Bigelovia graveolens*, var. *glabrata*.

Length 13 millim.

The spot of fourth abdominal segment is white, sharply three-toothed posteriorly, and indented on each side anteriorly.

15. *Jurinia algens*, Wd.

One female, Rio Tularosa, below Blazer's Mill, about 6000 feet, Oct. 20. On flowers of *Bigelovia graveolens*, var. *glabrata*.

16. *Jurinia apicifera*, Walk.

Seven male and two female specimens. Five males on flowers of *Aster laevis*, L., Rio Bonito, at Austen's Ranch, about 6400 feet, Oct. 17. Two males and one female on flowers of *Senecio Douglasii*, DC., and one female on flowers of *Aster laevis*, L., Rio Ruidoso, above Dowling's Mill, about 6500 feet, Oct. 15.

The silvery cinereous sheen of anal segment is obscure in all, and hardly perceptible in some. The foot-claws of male

are not so long as in Brownsville specimens, and are often reddish or yellowish at base.

17. *Jurinia hystrix*, Fabr.

Seventeen specimens, all females. Rio Tularosa, below Blazer's Mill, about 6000 feet, one taken Oct. 13 and the others Oct. 20. On flowers of *Bigelovia graveolens*, var. *glabrata*.

Length 12-15 millim.

These come nearest to Williston's form c (Trans. Am. Ent. Soc. xiii. p. 299). Front tarsal joints are not dilated, palpi yellow, third antennal joint about same length as second. About six or eight strong spines in row in middle of hind border of second abdominal segment, and two at each side on hind border, but no continuous row on hind border of second segment. A continuous row of strong spines on hind border of third segment. All with two orbital bristles.

This species may be known by the yellow pile of occiput, the black or brown bases of wings, and the faintly but perceptibly clouded anterior cross-vein. The anterior portion of thoracic dorsum is yellowish dusted, the abdomen is chestnut, head and body stout, front wide, posterior half of abdomen strongly spinose.

18. *Jurinia lateralis*, Macq.

One female, Rio Ruidoso, 4 miles west of Dowling's Mill, 6600 feet. On flowers of *Ithys glabra*, L., July 10 (Wootton).

One male, Rio Tularosa, below Blazer's Mill, about 6000 feet. On flowers of *Bigelovia graveolens*, var. *glabrata*, Oct. 20.

19. *Echinomyia iterans*, Walk.

Sixty-two specimens, of which only four are males, as follows:—twenty-eight females and two males, Rio Tularosa, below Blazer's Mill, about 6000 feet, Oct. 20, on flowers of *Bigelovia graveolens*, var. *glabrata*; one female, same locality and flowers, Oct. 13; eight females, Rio Bonito, Austen's Ranch, about 6400 feet, Oct. 17, on flowers of *Aster levis*, L.; twenty females and two males, Rio Ruidoso, above Dowling's Mill, about 6500 feet, Oct. 15, on flowers of *Senecio Douglasii*, DC.; and one female, same locality and flowers, Oct. 16.

Front tarsi of female are not widened in this species. Palpi are filiform, as in *E. Thomsoni*. Sides of face with two strong bristles near orbits. Antennæ black. Proboscis somewhat elongate and slender. Sometimes abnormal speci-

mens occur, showing three or even four strong bristles on sides of face near orbits. One female has three on one side and four on the other, the latter making a continuous row with the descending frontal bristles; another female shows only one bristle on one side and two on the other, while still another female shows but one on each side. The third antennal joint in male is usually more widened apically, sometimes very strongly so. In one female the third antennal joint is pale reddish, with rest of antennæ black.

Also one female, White Mountain, 9500 feet, July 6 (Wootton). In this specimen the second antennal joint is more reddish than black.

20. *Echinomyia Thomsoni*, Will.

One hundred and six specimens, as follows:—Sixty-five (eleven males and fifty-four females), Rio Tularosa, below Blazer's Mill, about 6000 feet, Oct. 20, except five of the females taken Oct. 13, on flowers of *Rigelia graveolens*, var. *glabrata*; twenty-one (twelve males and nine females), Rio Bonito, Austen's Ranch, about 6400 feet, Oct. 17, on flowers of *Aster laevis*, L.; twenty (seven males and thirteen females), Rio Ruidoso, above Dowling's Mill, about 6500 feet, Oct. 15, on flowers of *Senecio Douglasii*, DC.

These specimens vary in length from 8 to nearly 14 millim.

The female has two rows of orbital bristles on each side of the front, beside the row of frontal bristles along the vitta, while the male normally has only one row. But males occur having some extra orbital bristles, showing an approach to the two rows of the female. The claws and pulvilli in some males are much shorter also than in others. These secondary sexual characters in the male depend largely for constancy on the size and robustness of the specimens. I believe that all the above-mentioned specimens belong to this one species, as they otherwise agree well except for size. In occasional specimens the black of abdomen is somewhat more pronounced, while in others the red shows more conspicuously; but these are merely slight colour-variations, and are, moreover, quite rare. In some specimens the front is golden, while in others it is silvery pollinose. It may also be mentioned that the front tarsi are a little widened in the female.

There is a very great difference in size between the most robust specimens and the smallest ones. All the specimens examined, selected from the two extremes in size, show no median macrochètæ on first abdominal segment, two median

148 *Diptera from the Sacramento and White Mountains.*

on hind margin of second, a continuous row on hind margin of third, and two rows on fourth.

Also two females and one male, Rio Ruidoso, 4 miles west of Dowling's Mill, 6600 feet, July 10, on flowers of *Rhus glabra*, L. (Wooton). One of the females is considerably stouter than usual, and the male has the abdomen somewhat different in appearance; but it is due, I think, to the silvery pollen being rubbed and obscured.

21. *Echinomyia Victoria*, sp. n.

Echinomyia, sp. n. ♀, Towns. no. 60, Trans. Am. Ent. Soc. xxii. p. 72.

I propose the name *E. Victoria* for this species, as it does not seem to be named.

Nine females, Rio Tularosa, below Blazer's Mill, about 6000 feet, Oct. 20, on flowers of *Bigelovia graveolens*, var. *glabrata*; and a smaller female, Rio Ruidoso, above Dowling's Mill, about 6500 feet, Oct. 15, on flowers of *Senecio Douglasii*, DC.

Front tarsi wide in both sexes; palpi not slender filiform, but thickened and much shorter; sides of face without the pair of bristles near orbits; second antennal joint reddish yellow; proboscis shorter and stouter. Otherwise this species agrees with *E. iterans*, except that thorax is less brassy, and the abdomen has median line of black spots usually well pronounced, sometimes widened behind on last two segments. The species is on the average more robust. It differs chiefly from *E. dakotensis*, Towns., by the prevailing reddish-yellow colour of abdomen, *dakotensis* having much more black on abdominal segments.

Also one male, Rio Ruidoso, 8500 feet, July 6 (Wooton).

22. *Echinomyia neglecta*, sp. n.

Echinomyia, sp. aff. *Thomsoni*, Will., and *iterans*, Walk., of Towns. MS.

This species I have known for some time, and as it seems to be also without a name, I propose to call it *E. neglecta*.

Three females, Rio Tularosa, below Blazer's Mill, about 6000 feet, Oct. 20, on flowers of *Bigelovia graveolens*, var. *glabrata*. Three females, Rio Ruidoso, above Dowling's Mill, about 6500 feet, Oct. 15, on flowers of *Senecio Douglasii*, DC.

This species differs from *Thomsoni* by the antennæ being wholly deep black instead of second joint reddish yellow; in abdomen (except imperfect median stripe) being brighter red,

with the silvery sheen much less noticeable; and in the thoracic dorsum being less brassy pollinose. It is an intermediate form between *Thomsoni* and *iterans*; from *iterans* it differs in the front tarsi of female being widened, abdomen more deeply tinged with red, and dorsum of thorax less brassy pollinose. Palpi are slender, filiform, as in both *iterans* and *Thomsoni*.

Three of the above specimens have three bristles on sides of face near orbits, instead of only two.

Also one female, Rio Ruidoso, 4 miles west of Dowling's Mill, 6600 feet, July 10, on flowers of sumac, *Rhus glabra*, L. (Wooton).

23. *Echinomyia*, sp.

Two specimens (male and female) of a blackish species, with a stigma-like spot on wings. Taken by Prof. Wooton on White Mountain, 9000 feet, July 3, on flowers of *Helenium Hoopesii*, Gray.

XIV.—*The Physiological Importance of the Air-Spaces in Flying Animals.* By R. VON LENDENFELD*.

It is well known that in the bodies of the majority of insects and birds large spaces filled with air are met with which appear morphologically as local expansions, relatively as appendages of the respiratory organs. They are developed in very different ways in the different species, and are not present in all insects. In general it may be said that in animals capable of strong and sustained flight they are highly developed and spacious, that in bad fliers they attain a lower degree of development or (as in some insects) do not occur at all, and that in all non-flying insects they are entirely wanting. It is thus rendered probable that they are in some way directly or indirectly connected with the flying motion, and are to be regarded physiologically as organs subservient to flight. Further, from the very considerable size of these organs, especially in Hymenoptera and many birds, a conclusion may be drawn as to the great importance which they must possess.

With reference to these air-spaces three suppositions are possible:—(1) they are exclusively accessory respiratory

* Translated by E. E. Austen from the 'Biologisches Centralblatt,' xvi. Bd., No. 21 (November 1, 1896), pp. 774-778.

organs or an auxiliary breathing-apparatus; (2) they are exclusively mechanical locomotor organs (structures for the maintenance of equilibrium and the regulation of specific gravity); (3) they perform both of these functions.

We might well suppose that good and powerful fliers, just as they have a relatively heavier heart than other birds (Parrot), also need especially efficient respiratory organs, and that accordingly their air-sacs are breathing-organs. The **air-sacs** themselves, however, cannot be respiratory organs, on the one hand since they exhibit no arrangements whatever for increasing their surface (folds, cells, or similar developments), and on the other hand because (in birds) the membrane which bounds them is in general poorly supplied with blood-vessels (Drosier and other authors). It is only on the inner surface of pneumatic bones that we find capillaries in greater abundance, and here, moreover, the excretion of carbonic acid has been demonstrated experimentally (Baer). Nevertheless the respiration in this case cannot be anything considerable, since in these rigid caeca-like chambers the air must be in a state of almost complete stagnation. But although oxidation of the blood takes place only to an altogether inconsiderable extent in the walls of the air-sacs, these structures might still as a motor-apparatus, as bellows, play an important part in respiration; they might have to provide for the active ventilation of the parts which actually oxidize the blood. It was formerly supposed that the intra- and extra-thoracic air-sacs of birds contracted alternately, and that by this means the air was forced to and fro through the lungs (Sappey). The results of later investigations, however, obtained by the aid of the graphic method, and as to the correctness of which no doubt whatever can exist, have shown that the air-pressure in all air-sacs rises and falls simultaneously. There is consequently no current of air from air-sac to air-sac, but only a current passing to and fro between the mouth and the air-sacs. Now although the air-sacs communicate directly with the bronchi through wide open tubes, nevertheless a great part of the air that streams to and fro between the mouth and the air-sacs, especially in expiration, is said to pass through the fine canals of the lungs and to renew continually the air in the pulmonary alveoli (Baer). To this, however, it must be objected that the anatomical conditions do not support the justice of this assumption. If this were the sole or the most essential function of the air-sacs, we should, at any rate, expect to meet with arrangements which would cause the whole of the air in the air-sacs, or, at least, the greater portion of it, to pass through the actual respiratory part of the

breathing-apparatus. There are no such arrangements, however. In insects, by means of wide sections of tracheal tubes, the great air-vesicles are in direct, immediate, and free communication with the stigmata, so that the air which enters them from without and that which is given off from them to the exterior cannot pass through the respiratory terminal branches of the ramifying tracheal trunk. In birds the cephalic air-sacs, as well as some of the subcutaneous ones in certain species, are connected with the nasal cavity; consequently the currents of air passing to and fro between these sacs and the exterior cannot enter into the lungs at all. The air-sacs of the body and limbs communicate with the bronchi, with which they are openly connected by means of wide canals. It is true that from the walls of these spacious tubes, which traverse the lungs, there arise narrow ducts which lead into the actual lung-parenchyma; but in spite of this the greater part of the air, which passes to and fro between the exterior and these sacs, will take its course through those wide tubes, and it is only quite insignificant dribblets from the air-stream that will pass through the parenchyma of the lungs.

The cephalic air-sacs and the subcutaneous air-sacs belonging thereto in birds, as well as the majority of the air-sacs in insects, consequently do not contribute at all, while the remaining air-sacs contribute only in a very slight degree, by no means in proportion to their size, to the ventilation of the parts of the body which absorb oxygen and excrete carbonic acid. As an accessory respiratory apparatus they can therefore at best function only incidentally: their chief function must be a different one.

We thus arrive at the second and third of the alternatives stated above: we have to ask in what manner the air-sacs can mechanically support the faculty of flight. In any case they reduce the specific gravity of the body very considerably, and I presume that this might increase the power of flight, and especially facilitate materially the maintenance of equilibrium in the air, although the enlargement of the body connected therewith would considerably increase the resistance of the air, particularly in rapid flight, and so under certain circumstances would also bring disadvantages in its train.

Since the air contained in the pneumatic spaces in warm-blooded birds has a higher temperature than the outer air, the air-sacs in them certainly have a direct lifting effect—they operate as balloons—but this is so inconsiderable that practically it cannot come into account at all.

Apart from those air-cavities that (in birds) extend in the bones, and the object of which—the reduction of the weight of the bones without impairing their strength—is distinctly evident, all air-chambers are readily contractile and dilatable. The spiral thread of chitin that stiffens the tracheæ in insects is absent from the walls of their larger air-chambers, and in birds the walls of the air-sacs of the body are very delicate and soft membranes.

It appears certain that flying animals have the power, by means of voluntary contraction of the body-muscles, to alter very rapidly the degree of fullness of these air-chambers (of course with the exception of those that are situated in the bones), and that thus they are enabled to displace their own centre of gravity, and to change the specific gravity as well as the size of their parts. But we now have to ask how changes of this kind can be of so great an advantage to flight as to explain the extraordinarily high degree of the development of these cavities in good fliers.

In insects the air-chambers have manifold connexions one with another by means of various tracheal tubes; in birds an intercommunication between them does not appear to exist.

The most spacious air-bladders, in birds as well as in insects, are met with for the most part in the abdomen. In certain cases (in dragonflies and the condor) the air-chambers of the head are also very large.

In the case of insects it might be supposed that by means of a sudden discharge of considerable quantities of air from the stigmata of one side, or from only one particular stigma, a rebound might be produced which would entail a definite and advantageous lateral or turning movement of the body. A process such as this would be materially facilitated by the connexion of the air-chambers of the two symmetrical halves of the body. In the case of birds, however, an explanation of this kind is naturally impossible.

Since those birds that for the most part soar—that is, without strokes of their wings move, maintain themselves aloft, and even ascend—possess quite peculiarly well-developed air-chambers (I would remind the reader only of the pelican and certain large Raptores), it is natural to suppose that it is precisely in soaring that these structures come most into play. Since soaring requires only slight muscular labour, increasing the intensity of breathing but little, their high degree of development in birds which soar is an argument against the assumption that the air-sacs are nothing more than accessory respiratory organs.

In order to be able to give a decision as to their mechanical

function in the act of soaring we must first seek to determine how soaring birds perform this remarkable movement. It is certain that soaring and circling depend on overcoming the force of gravity by the aid and employment of the force inherent in the wind. Now the way in which this is turned to account appears to a certain extent doubtful. In the event of the speed of the wind increasing sufficiently quickly with increasing altitude the bird is able, by using the increment of the force of the wind, to mount in circles without a stroke of its wings (Lord Rayleigh). The wind is also said to be very irregular, to blow at any given point with quickly changing strength and, to a slight extent, with quickly changing direction. By utilizing the differences in the force and direction of the wind the bird can likewise keep itself poised and also ascend without flapping its wings (Langley). Lastly, the bird is able by circling, precisely like a rapidly rotating top, to acquire a certain inherent stability, which, operating like the string of a kite, renders it capable, when the current of air is continuous and perfectly equable in force, of soaring and ascending like a kite (Lendenfeld).

Be this as it may, soaring at any rate depends upon an admirable utilization of the force of the wind, which is only attained by the bird always setting its expanse of sail, the whole underside of its body (Müllenhoff), precisely in the proper angle with the horizontal plane and with the direction of the wind. This process must be very difficult—indeed, it is hardly possible to imagine how a free-soaring bird, which presents a large surface of sail to the wind, in the midst of violent currents of air and in a constantly changing position, without any fixed point of attachment, can maintain its equilibrium, and can regulate efficiently, with ease and precision, the inclination of the surface of sail which it forms.

Since the bird soars free, the position of the surface of sail can really be attained only by changes in the position of the centre of gravity with reference to the expanse of sail, as well as by alterations of the parts that feel the resistance of the air. But changes of this kind in the position of the centre of gravity and alterations of the resisting surfaces can be brought about by alterations in the degree of fullness of the various air-sacs, since by their inflation parts of the body are enlarged and forced away from the centre. It is true that these changes are small, but even small changes of this sort will be enough to produce a considerable and sufficient result.

Although this action of the air-sacs is most distinctly marked in soaring, it will nevertheless also come into opera-

tion in ordinary flight with strokes of the wings, in which, indeed, the kite-like action of the spread of sail always comes jointly into play to a greater or less degree.

Granted, therefore, that the air-sacs to a certain extent assist respiratory activity, that is, in the case of birds, their main object will still be a mechanical one—the reduction of the specific gravity of the whole animal and the regulation of the specific gravity and the size of its parts, as well as of the position of the centre of gravity.

XV.—*Description of a new Snake from Sierra Leone.*

By G. A. BOULENGER, F.R.S.

Aparallactus niger.

Diameter of eye greater than its distance from the oral margin. Rostral much broader than deep, the portion visible from above one third as long as its distance from the frontal; internasals slightly broader than long, widely separated from the præocular; a single præfrontal, forming sutures with the nasal and præocular; frontal nearly once and a half as long as broad, as long as its distance from the end of the snout, much shorter than the parietals; nasal semidivided, in contact with the præocular; two postoculars; a single temporal; seven upper labials, third and fourth entering the eye, fifth and sixth in contact with the parietal; first lower labial in contact with its fellow behind the symphysial; anterior chin-shields longer than the posterior, in contact with four lower labials. Scales in 15 rows. Ventrals 164; anal entire; subcaudals 60. Uniform black above; ventrals white, edged with black; subcaudals black in the middle and on the posterior and outer borders.

Total length 335 millim.; tail 80.

A single male specimen in a small collection made by Mr. W. G. Clements in Sierra Leone.

The same collection contained a specimen (head and neck only) of *Naja Guentheri*, Blgr., the habitat of which was still unknown.

XVI.—*Description of a new Fish from Lake Nyassa.*

By G. A. BOULENGER, F.R.S.

Chromis auratus.

23 teeth on each side of the outer series of the upper jaw. Depth of body $3\frac{3}{4}$ in total length, length of head $3\frac{1}{4}$ times. Profile of snout curved; eye equally distant from the end of the snout and the gill-opening, its diameter 4 times in length of head and but slightly greater than interorbital width; maxillary not extending to below anterior border of eye; three series of scales on the cheek below the eye; opercle and interorbital region scaled; preopercular limba forming a right angle. Gill-rakers very short, 8 on lower part of anterior arch. Dorsal XIX 6; spines subequal in length from the fourth, which is $\frac{1}{2}$ length of head. Pectoral pointed, $\frac{3}{4}$ length of head; ventral as long as pectoral, reaching vent. Anal III 6; third spine longest, stronger and a little longer than dorsals. Caudal truncate. Caudal peduncle a little longer than deep. Scales $34\frac{5}{12}$, finely denticulate below the lateral line; lat. l. $24\frac{1}{12}$. Bright golden yellow, with three black stripes, one along the side of the body from the eye to the base of the caudal, a second above the upper lateral line from the occiput to the caudal peduncle, and a third along the dorsal fin; two curved black bands across the snout from eye to eye; a few black spots on the upper part of the caudal fin.

Total length 75 millim.

A single specimen from Monkey Bay, W. Nyassa; presented to the British Museum by G. H. Pigott, Esq.

XVII.—*On Movement in a Circle as the Fundamental Form of Movement in Animals: its Cause, Manifestation, and Significance.* By F. O. GULDBERG*.

[A Lecture † delivered before the Biological Society of Christiania, March 30, 1896.]

THE majority of those who are accustomed to walk in the fields and woods with open eyes for the observation of animal

* Translated by E. E. Austen from the 'Biologisches Centralblatt,' xvi. Bd., No. 21 (November 1, 1896), pp. 770–783.

† This lecture is a brief preliminary communication on the subject of an investigation which, so long ago as the spring of the year 1888, the

life have surely been struck by the readiness with which animals belonging to the same family or community find each other again, after having separated voluntarily or under compulsion. Indeed, even newly hatched or new-born young, which one surely cannot easily suspect of having a fully developed memory for places or any acquaintance with the locality, and as to which it is quite impossible to imagine that they are already in possession of the full use of their senses, nevertheless again discover, apparently with the greatest ease, their parents, brothers and sisters, or companions, even when they have been separated from them for so long a time or by so great a distance that their sensory powers are inadequate to bring them into direct communication one with another.

For life in a state of nature has furnished us with a series of observations, showing that the higher animals, at all events under circumstances in which their senses do not act normally or perfectly, or when they are prevented from bringing themselves into communication one with another by aid of their senses, seek and find each other again in such a manner that **they return to the spot where they were separated** or where their senses corresponded for the last time. This ordinary and necessary returning of animals to the spot where they were separated must, as I shall show, be of a double nature, namely both **instinctive** as well as **physiological**, since meeting takes place by two different methods, either in consequence of the animals by aid of their senses seeking and finding their way back to the spot where they separated, or by their making **without the aid of their senses a circular movement**, which necessarily also leads them back to the place of separation. Now, in order to come to a clear understanding as to the nature of this circular movement, as to what must be the basis or cause of the instinctive phenomenon in question, I have instituted, in conjunction with my fellow-worker Prof. G. A. Guldberg, a series of physiological experiments whereby, by depriving the subjects of the experiments of their senses, we have succeeded in compelling them to make a circular movement of this kind. This movement in a circle is certainly to be regarded as having a **physiological origin**, and as the immediate cause we assume a func-

author proposed in a less complete form to his brother, Prof. G. A. Guldberg, who subsequently became a fellow-worker, especially as regards the morphological and physiological portion of the study. With reference to the actual evidence which has been collected, this will be laid before the scientific world in detail at an early period, so soon as time and opportunity permit.

tional asymmetry in the animal. It must here, however, be stated distinctly that this circular movement is not to be confused with the *manège*-movement known in physiology in the case of brain-lesion; for a series of morphological investigations undertaken by Prof. G. A. Guldberg renders it in the highest degree probable that the actual cause of this "senseless" circular movement is to be sought in the asymmetrical structure of the organs of locomotion, as to which a short communication will be found in the next number of this periodical (*Biol. Centralbl.*).

This circular movement also appears in the life of animals in the natural state so soon as the impressions derived from the senses are unable to exercise a guiding influence.

For a series of movements in circles which, so far as they were known, stood out as inexplicable riddles, must be regarded as results of the physiological action of circular motion upon natural motion guided by imperfect cerebral activity and failing senses. The forms of movement thereby produced, which become more or less regular circles, and are in part well-known phenomena in the case of higher animals and human beings, I have termed provisionally **biological circles** or **circular wanderings**.

In spite of the fact that in this connexion there is reason to suppose that similar phenomena in the life of insects can or must be explained in the same way as in Vertebrates, owing to the want of physiological experiments I can do nothing more here than merely to allude to this circumstance. In the case of higher animals, especially birds and mammals, on the contrary, the phenomena that have been observed are so numerous and the physiological experiments so far advanced that I now consider myself justified in propounding the theory as to the reality and signification of circular motion.

By questioning divers, who nowadays use electric lamps at the bottom of the sea, and lighthouse-keepers on the coast of Norway, I have obtained statements to the effect that in the places where these men work a variety of phenomena are always observed that are traceable in the same way—namely, circles described by fishes swimming in the light of the electric lamps and similar circular flights on the part of birds in front of the lighthouse (not round it). The easiest and most natural explanation that can be given of these movements is that they are "**biological circles**," which arise from the fact that the animal is blinded by the light, from which it seeks to get away by swimming or using its wings; since, however, it cannot find anything else to show it the way,

while the guiding sense is blinded, movement passes into the physiological circular direction, and it returns to the light. The constant repetition of these circles, until the birds often drop exhausted near the lighthouse, as well as the apparently disturbed state of mind of the animals when they are flying and swimming round and round, in our opinion also support such an explanation of this phenomenon. Mention may also be made of the circling flight of the willow-grouse and capercailzie, well known to the Scandinavian peasant-gunners who lie in wait for these birds, in which the instinct of locality alluded to above seems to appear, just as a similar instinct seems to prevail in beasts of prey during the pursuit of game. But the best illustrative evidence in favour of these biological circles is furnished by mammals, which more frequently come into contact with man either as domestic animals or as objects of the chase.—The lecturer here produced in explanation of his statement a series of graphic charts, which were sent to him by the foremost sportsmen in the country (Norway); these charts show that the course taken by hunted animals (hares and foxes) when pursued by the hounds exhibits over and over again the curve of a biological circle. This applies especially to hares, for the circles, or “Turen,” as Norwegian sportsmen call them, described by these animals can often be distinctly followed from one end to the other, since it is only paths, high roads, the animal's own track, defiles, and insurmountable natural obstacles, or sudden interruptions due to a *rencontre* with hunter or hound, that produce changes in, or a cessation of, the biological circular course.

From these charts of circular runs it is also to be seen how the same individual always describes the biological circle towards the same side, whence it appears that the individual in travelling along is bound to go to the right or the left.

With reference to mankind the phenomenon may be regarded as being so well known that one need only mention the familiar accounts in literature and the stories with which people are acquainted in order to make the comprehension of the subject thoroughly real. There are also a multitude of statements as to rowing in a circle in a fog at sea, and in both cases, in wandering as well as in rowing in a circle, the phenomenon has had such a disturbing effect upon the condition of the senses, that the individual in some instances did not even trust the compass, and in others, as has been the case with superstitious folk, actually thought himself in the hands of a higher power. Of this, indeed, there is proof enough in tales and stories from popular life.

The effects of circular movement also make themselves

felt in military marches with an extended front, since it is only by accurate aiming and never losing the object while marching that the guide is enabled to keep the direction.

The lecturer then proceeded to show what is the importance of this peculiar form of animal motion for the creatures that possess it. He found in the fact that all animals are firmly fettered to definite natural conditions and are pretty helpless when they overstep definite limits or when they become separated from their parents or their home—especially in the earliest period of their existence, before they have learnt to use their senses and faculties—a decided proof that this circular movement, which, with irresistible force, brings each being that is under its control back to the place that possesses the conditions necessary for the preservation of life and for its prosperity, must also be of **fundamental importance** for the **maintenance of life** and the development of the individuals affected. It is thus seen that this form of movement is universally distributed—it is one of the general laws.

Imagination and superstition have eagerly seized upon this mysterious force in natural life, and have created therefrom a supernatural power. To expound this in greater detail lies beyond the scope of the present study; nevertheless it may be pointed out that Norwegian country-folk in general are wont to term this travelling in a circle “at tråde paa Vildstraa,” approaching on a false scent, that is, going astray, though in reality the intention of nature, if one may so express oneself, is exactly the opposite. In the realm of nature this phenomenon is a precaution in order that the living animal shall never go astray, but always be able again to find the spot that possesses the conditions necessary for the maintenance of life and for further development, the localities and surroundings that afford protection and food, before ever the offspring have learnt to use their senses and faculties—the native place to which all animals in the struggle for existence must so often return, be it the udder of the cow, the warmth-giving wings and the guiding experience of the hen, or the sheltering tree or bush chosen by maternal instinct. In accounts showing how very liable young animals are to perish when they are separated by the hand of man from this connexion with home and parents, we may also see the operation of the law, since under such circumstances its effects are just as destructive as under natural conditions they are the means of salvation. It is simply the opposite result carried to the same length.

The effect of this circular movement in the **psychical life** of animals may also be regarded as full of significance, since,

in spite of the innumerable false steps into which the animal may be betrayed by unpractised senses and inexperienced brain, it always brings it back to the right spot and to the proper conditions. To formulate my interpretation of this fact, I would say that nature's educational skill would be unintelligible without the law of circular movement.

Moreover, it is also necessary to point out that the same law appears to be the foundation of the instinct of locality in the higher animal world—that is, the already mentioned impulse to return to the spot where the animal lost its followers, and, in connexion therewith, the capacity for easily finding its companions again.

How far the importance and breadth of this instinct extends, it is certainly as yet impossible to say; whether it will ever be possible I know not; it may, however, be assumed that the fundamental forms of movement mentioned and the instinct founded thereon are closely connected with the "law of love of home" or the instinct of locality, to which the great annual migrations of animals are to be referred. And if I may be allowed to cast a glance beyond the limits of this paper, while presupposing that the law of physiological circular movement is recognized by the scientific world, I must first refer to the circumstance that circular movement will be a very serviceable instrument in investigations as to the functional breadth and signification of the senses in the different animals and animal groups.

Furthermore, in alluding to observations upon lower animals attention must also be directed to the probability that in the lowest classes the physiological circular movement is perhaps the sole form of movement that the organism possesses besides the mechanical action and the physiological reaction. In the case of such a manifestation, physiological circular movement, when its reality and extent shall be sufficiently investigated and understood, may perhaps prove to be of greater biological importance and open up a wider field for study than we at present anticipate. In any case, it will probably be found that even now we may with some show of justice regard the circular movement alluded to as a fundamental form of movement in animals, which we must never omit to take into joint consideration in studying the phases in the development of animal life, no matter whether we are dealing with the biology of individual species or with the psychical genealogy of a larger animal group.

XVIII.—*On the Tsu-shima Representative of the Japanese Sable.* By OLDFIELD THOMAS.

THE late Mr. P. A. Holst, while collecting birds for Mr. Henry Seebohm in the far East, obtained and sent home five specimens of the Marten which inhabits the islands known as Tsu-shima, between Corea and Japan. These specimens are clearly related to the Japanese Sable (*Mustela melampus*), but differ so much in the details of their coloration as to demand subspecific separation. Two of the specimens are in summer pelage and three in winter, and, for comparison with them, there are in the British Museum one summer and four winter examples of the Japanese form. The summer and one of the winter specimens are co-types of Temminck's species, while the former is, in addition, the type of *M. japonicus* of Gray, who, in spite of Temminck's definite account of the seasonal changes, considered the brown summer form as characterizing a different species, and re-named it accordingly.

Mustela melampus tsuensis, subsp. n.

Similar to the typical form in size, quality of fur, and in cranial and dental characters, but distinguished by the following colour-characters:—

In winter pelage.—General colour above dirty yellowish brown instead of rich orange-yellow. Top of head to nape, instead of only to forehead, ashy greyish white. Muzzle, up to and including the orbital region, and lips (both upper and lower) black; interramia * brown; throat white, in continuation with the white of the cheeks and crown, passing on the chest and belly into dark brownish yellow. Fore limbs black from the elbow downwards; hind limbs black on the feet, brown below the knee.

In this pelage the most marked distinctions from *typicus* are the black instead of brown muzzle and lips, the brown instead of white interramia, and white instead of yellowish throat, besides the difference in general tone and greater extension backwards of the ashy colour of the crown.

* *Interramia*.—The space between the rami of the lower jaw, behind the "chin" but anterior to the "throat." In describing mammals a name is constantly being wanted for this region; but I have been quite unable to discover whether there is already one in existence, and therefore now suggest one. I have personally felt the want of such a word again and again, especially when describing antelopes, in which the interramia is particularly distinct from either chin or throat.

In summer pelage.—General colour singularly like that of a dark-coloured pole-cat (*Putorius putorius*), much darker than in the typical form. All the parts that are brown in *typicus* are black in *tsuensis*, while the whole of the limbs, and not only their distal portions, are black. Below, the lips and interramia are black, the light mottling of the throat is less in extent but much brighter in colour, orange-yellow or orange, and the belly is much darker brown. Some of these differences may be due to the faded state of the only summer *typicus* available, and therefore less stress is to be laid on them than on those in the winter pelage. On this account the type selected is a winter example.

Approximate dimensions of the type, from a skin (♂):—

Head and body 470 millim.; tail 160; hind foot 85.

Skull: basal length 78; greatest length 88; greatest breadth 54; interorbital breadth 23; palate length from gnathion 41; palate breadth between outer corners of $\frac{2}{3}$ 30.

Hab. Tsu-shima Islands.

Type: B.M. 91. 10. 14. 3, collected at Kamoze, April 17, 1891, by Mr. P. A. Holst.

XIX.—On a new Gazelle from Central Arabia.

By OLDFIELD THOMAS.

SURGEON LIEUT.-COLONEL A. S. G. JAYAKAR, of Muscat, to whom our knowledge of the fauna of South-eastern Arabia is largely due, has recently sent to the British Museum a further consignment of mammals, collected within the last two years. Besides the Oman specimens, all of which belong to species recorded in my paper on the mammals of that district*, there are several skins of a Gazelle received by Dr. Jayakar from Nejd, in the interior of Arabia, and these prove to represent a most distinct form from any previously known.

It may be called

Gazella marica, sp. n.

Size about as in *G. dorcas*. Colour of head very much as in *G. leptoceros* and *Loderi*—that is to say, with the usual gazelline face-markings almost obsolete. The central and lateral dark bands of the face are of about the general body-colour, and very slightly defined from the paler bands between them. In the middle line the central dark band, such as it

* P. Z. S. 1894, p. 448.

is, barely reaches to the level of the anterior canthus, the whole forehead, over an area roughly corresponding to the frontal bones, being white. Ears long, their backs uniformly pale fawnish white. Body pale fawn, of about the tint of *G. dorcas*, much paler than in the dark *G. muscatensis*. Pale lateral band scarcely visible; dark lateral band and pygal band pale brown, little marked, scarcely darker than the dorsal colour. Limbs whitish or very pale fawn throughout; distinct knee-tufts present.

Skull of about the size and proportions of that of *G. dorcas*, but the nasals are longer and the premaxillæ shorter; the nasal opening is consequently shorter and also broader. Posteriorly the nasals are more broadly rounded. Bullæ much inflated.

Horns unfortunately not perfectly describable, as in the only old male they have had their ends cut off, and the type is rather immature. So far as can be seen, however, they are of a somewhat lyrate shape, short, not very strongly curved backwards, and with their ends turned inwards towards each other. Female with horns of the usual proportions.

As to measurements, the distance from the calcaneum to the tip of the hoof round the curve is 305 millim., the same measurement in *G. muscatensis* being about an inch less. The ears, moistened, are about 135 millim. from notch to tip.

Skull of the type: basal length 150 millim.; greatest length 167; greatest breadth 77; nasals, length 57, breadth 22; nasal opening 42×24 ; gnathion to orbit 88; gnathion to front of tooth-row 36; palate length 86.

The horns of the type are just 200 millim. (8 inches) in length round the curve outside, and, judging from comparison with the older specimen, would have probably become about a couple of inches longer.

Hab. Nejd, Central Arabia.

Type Brit. Mus. 97. 1. 14. 5.

Dr. Jayakar says in his letter:—"Among the mammals are four Reem Gazelles from the Nejd desert, and one from Dahireh, the north-western district of Oman. It is probable that the species extends down to the desert behind Oman, as that is continuous with the Nejd desert."

No described species really needs any detailed comparison with *G. marica*, which differs from nearly all known Gazelles by its obsolete face-markings. Of the few species similarly pale-faced, *G. leptoceros* and *Loderi* are much larger and have wholly different elongate horns, and *G. gutturosa*, *subgutturosa*, and *picticaudata* have hornless females.

XX.—New Eastern Heterocera.

By Col. C. SWINHOE, M.A., F.L.S.

Fam. Sphingidæ.

Genus PHYLLOSPHINGIA, nov.

♂. Palpi broadly scaled, upturned, and not reaching vertex of head, which has a somewhat pointed crest; antennæ fasciculate; thorax with sharp dorsal crest. Fore wing long and narrow, outer margin oblique, evenly and deeply crenulate, hinder angle lobed and the inner margin excised before it. Hind wing with the costa excised to middle, then produced upwards to a lobe; outer margin deeply and evenly crenulate; veins 6 and 7 from upper angle.

Allied to *Cypa*, Walker, and *Degmaptera*, Hampson; differs from the former in the broadly scaled palpi, the evenly crenulate outer margins, and the excised lobed costa of hind wing; from the latter in the broadly scaled palpi, the evenly crenulate outer margin, the less excised inner margin of fore wing and costa of hind wing; and from both in veins 6 and 7 of hind wing being from angle of cell.

Type *P. perundulans* mihi.

1. *Phyllosphingia perundulans*, sp. n.

♂. Rosy chestnut-brown; shaft of antennæ, upperside of palpi, top of head, and a thin dorsal band on thorax dark brown. Fore wings with the costa dark brown, broadly brown on the basal third, and with some brown marks on the apical third, from whence to the apex there are some whitish suffusions; the disk crossed by three or four very indistinct brown lines; a dark and bright chestnut band on fascia from the middle of the cell, broad and lobed beneath the outer half of the median vein, and halfway outwards beneath vein 4, and another similar fascia nearly joining it from the outer margin below the apex, its upperside limited by the whitish apical suffusion. Hind wings coloured like the fore wings, with indications of faint transverse bands. Underside brighter chestnut-colour, the white suffusions near the costa towards the apex being developed into white bands; the hind wings brighter coloured than the fore wings, being of a red-chestnut, with a rosy-white band before the middle.

Expanse of wings $4\frac{7}{8}$ inches.

Jaintia Hills.

Fam. Notodontidæ.

Genus EUPLEXIDIA, nov.

♂. Palpi curving upwards, second joint thickly scaled, third oblique; antennæ with very minute cilia; a tuft on metathorax, also dorsal tufts on abdomen near the base; tibiæ with some long hairs. Fore wing with the apex rounded; vein 10 slightly touching 8 and 9, to form the areole. Hind wing with veins 6 and 7 stalked, 8 from the cell near the base, 5 very slight and from middle of discocellular.

Type *E. noctuiformis* mihi.

2. *Euplexidia noctuiformis*, sp. n.

Euplexidia noctuiformis, Swinh. MS.; Hampson, Moths, iv., Suppl. p. 461 (1896).

♂. Antennæ, head, body, and fore wings brown, with a slight pinkish tinge. Fore wings irrorated with white and black atoms in parts; costa with black marks and with three white dots near the apex; two or three small black dots near the base; a rather prominent key-shaped black mark placed longitudinally in the centre of the wing below the cell; orbicular and reniform marks indistinct, grey, marked with black; an indistinct sinuous grey submarginal line; a similar but more indistinct marginal line and black points in the interspaces on the margin. Hind wings white, with a brown marginal line and white cilia interlined with brown.

Expanse of wings $1\frac{1}{6}$ inch.

Cherra Punji.

Fam. Larentiidæ.

3. *Cryptoloba olivaria*, sp. n.

♂ ♀. Pale olive-grey; fore wings with minute brown costal dots close to each other; a grey transverse nearly straight band just before the middle, commencing at a brown mark on the costa; a similar discal band across both wings, with a disjointed black line running down its inner side above the middle on fore wings, the space between this band and the margin with a darker shade than the rest of the wings and with indications of a submarginal grey line; a brown spot on costa of fore wings before the apex.

Expanse of wings $\frac{7}{16}$ inch.

Shillong.

Fam. Boarmiidae.

4. *Dalima gigantea*, sp. n.

♀. Greyish ochreous; a straight, broad, dull ochreous-red band before middle of fore wings; a black cell-spot; a thick medial line across both wings, bent outwardly below costa of fore wings, and a broad marginal band of the same dull ochreous-red colour on both wings, with its inner margin on fore wings bent, corresponding to the angle of the middle line; this band is diffused hindwards, and joins the middle line on fore wings, and includes an ochreous patch at apex, a small one in the middle near the outer margin, and a large one near the hinder angle; in the hind wing it is diffused inwards, covering half the wing, and includes several ochreous patches; all the ochreous portions of both wings are sparsely covered with black dots. Underside as above, with the bands and dots darker and more prominent; the hind wing is produced into an angle at vein 6, as in *D. truncataria*, Moore; the fore wing has the apex much more acute, and has two large excavations immediately below it.

Expanse of wings $4\frac{2}{10}$ inches.

Jaintia Hills.

I have two perfect females; the pattern and shape of wings are quite different to those of any species of *Dalima* known to me.

Fam. Chalcostiidae.

5. *Herpa eupoma*, sp. n.

♂. Black, collar white; an orange-red spot on each side of the thorax in front corresponding to the broad orange costal band of the fore wings, which fines down to a line at one fourth before apex; a black band near base from costa to hinder margin, the orange inside the band nearly red, like the spots on the shoulders, principal veins pale; hind wings also black, bordered with bright red-orange, broadly on the costa, occupying one third of the wing-space, curving outwardly in the middle, the orange colour on the outer margin confined only to the cilia. Underside as above, all the veins orange-coloured, and a streak of that colour running down vein 1 c of the hind wings.

Expanse of wings $1\frac{6}{10}$ inch.

Jaintia Hills.

Looks like a *Soritia*, but has the venation of *Herpa*, the origin of veins 7 and 9 being more separated than usual in the genus.

Fam. Trifidæ.

6. *Ancara olivescaria*, sp. n.

♀. Head, body, and fore wings bright olive-brown, irrorated with black atoms; transverse bands black, double, composed of disconnected lunular marks; basal and ante- and postmedial orbicular and reniform with black rings, the former within the antemedial band and has a small square black patch beneath it; costa with black spots; a transverse discal row of white dots; black marginal points in the interspaces: hind wings black; cilia of both wings dull ochreous, with black patches. Underside pale olive-brown; fore wings with the inner parts black; both wings with black cell-spots and rather broad black transverse band.

Expanse of wings $2\frac{3}{10}$ inches.

Jaintia Hills.

Fam. Acontiidæ.

7. *Eublemma silicula*, sp. n.

♂. Pale pinkish grey; palpi brownish on the outer sides; top of the head white. Fore wings with a white costal line; a grey spot at the end of cell; some reddish-brown spots on the costa, the largest at apex, with two black dots below it; indistinct ante- and postmedial outwardly curved pale lines. Hind wings with the costal portion whitish; both wings with a grey marginal line.

Expanse of wings $1\frac{1}{10}$ inch.

Karachi; Hydrabad, Sind; Koni, Shan States.

Fam. Stictopteridæ.

8. *Stictoptera cerea*, sp. n.

♂. Palpi, head, thorax, and fore wings bright chestnut-brown. Fore wings crossed by five double sinuous lines, which are here and there marked with white atoms—first at base, second before the middle, third medial, touching the inner side of the large ear-shaped reniform, fourth discal (well marked with white specks), fifth submarginal; four white dots on costa near apex. Hind wings black, with prominent white cilia. Underside: both wings uniform dull black; fore wings with the white costal dots and some white dots on the black cilia; hind wings with cilia pure white as above.

Expanse of wings $1\frac{1}{2}$ inch.

Gilolo.

Allied to *S. anthyalus*, Swinh.

Fam. Quadridæ.

9. *Remigia crinigera*, sp. n.

♂. Pale fawn-colour; fore wings with a large brown spot at the end of cell; an erect discal brown band, its inner margin well defined by a dark brown thick line; the band is diffuse outwardly and is limited by an indistinct sinuous grey line halfway between the thick line and the margin; marginal black points between the veins. Hind wings with a brown dot at the end of cell, and a broad brown marginal band and marginal points. Underside paler, bands and cell-spots as above; a row of five or six small spots beyond the middle on the hind wings, and black marginal points on both wings; mid and hind tibiæ with very large tufts of long hairs.

Expanse of wings $1\frac{1}{4}$ inch.

Gilolo.

Fam. Focillidæ.

—10. *Mecodina obscurata*, sp. n.

♂ ♀. Of a uniform pale fawn-colour, very similar in shade to the coloration of a pale *Remigia frugalis*, Fabr. Fore wings with a black spot at end of cell; bands slightly darker than the ground-colour—one medial below the spot, another discal from costa near apex to hinder margin near the angle, both broad and straight; between these bands, but nearest to the middle band, is a sinuous line, more or less dentate in parts: the hind wing is paler than the fore wing, and has traces of bands and lines similar to those on the fore wing, and on both wings there are black dots on the margin in the interspaces between the veins. On the underside the coloration is paler and perfectly uniform; the fore wing is immaculate, but there is a prominent black spot at the end of the cell of the hind wings; marginal dots as above.

Expanse of wings $2\frac{1}{10}$ – $2\frac{2}{10}$ inches.

Jaintia Hills.

11. *Mecodina napa*, sp. n.

♀. Of a uniform pale brown colour, tinged with pinkish; lines and markings dark brown. Fore wings with a double sinuous line at the base; double sinuous line before the middle; a black dot at end of cell; a single thick and nearly straight line beyond the middle nearly touching the inner edge of the reniform, which is in the figure of 8; a thick similar line from costa near apex to outer margin above the

middle; inside of this is a sinuous line running parallel with it to the outer margin, then in a dentate form to the hinder margin near the hinder angle; between this and the margin is another similar but indistinct line. Hind wing with an inner straight thick line; a thick discal line deeply angled above the middle towards the margin; an indistinct dentate line inside of this, a lunulate line between it and the margin, and an indistinct lunular marginal line on both wings. Underside much paler, uniform in colour; indications of two discal lines on fore wings and three central lines on hind wings.

Expanse of wings 2 inches.

Singapore.

Allied to *M. lanceolata*, Guen.

12. *Diomea orsilla*, sp. n.

♀. Dark rufous; fore wings irrorated with black and white atoms, smeared with white on the costa; costal line pale pink, with three white dots near the apex; ante- and postmedial whitish transverse lines, both bent inwards on the costa, where they are thickened; the former line is outwardly and the latter inwardly lined with red, and there is a bare round blackish reniform stigma between them; an indistinct sinuous submarginal pale line and very indistinct brown marginal points. Hind wings with the costal portion paler, with a central transverse pale line, corresponding to the post-medial line of the fore wings.

Expanse of wings 1 inch.

Singapore.

Allied to *D. fabularis*, Swinh., from Burma.

—13. *Zethes lahera*, sp. n.

♂. Both wings and body of a uniform pale rufous colour, tinged with grey; fore wings with a broad red band, edged on both sides with white, near the base, and a very large red patch at the apex, with a curved inner margin occupying nearly one fourth of the wing-space; a largish white spot, smeared with red, inside the patch near the apex; a black dot at end of cell, a white spot beyond; a discal and outwardly curved pale line from costa to hinder margin, the curve taking it inside the apical red patch; another dentated line between this and the margin; a lunular line close to the margin, the lunules being in the interspaces and having in them black points. Hind wings with a red patch on the anal

angle, and with outer pale transverse lines corresponding to the lines on the fore wings. Underside much paler, uniform in colour, with a thin discal (on hind wings medial) grey band across both wings.

Expanse of wings $1\frac{8}{10}$ inch.

Singapore.

There is a specimen from Tenasserim of this insect in the British Museum unnamed.

Fam. Pyralidæ.

14. *Sisyrphora cirralis*, sp. n.

♂. Palpi upturned, conically scaled; antennæ with the first joint dilated; the shaft laminate, excised at base, with tufts of scales on upperside before and after the excision. Fore wing with costal fold enclosing a tuft of long hair. Silvery white; head, base of collar, shoulders, and anal tuft black-brown; fore wing with the costa golden brown, expanding into patches at middle and end of cell, and conjoined to the discocellular line and patches beyond end of cell, all these markings being irrorated with metallic scales. Hind wing with discocellular spot; both wings with submarginal series of fuscous strigæ almost conjoined into a line and dentate inwards on vein 2.

Expanse of wings $1\frac{2}{10}$ inch.

South Borneo.

XXI.—Description of a new Species of *Delma* from Western Australia. By Dr. A. GÜNTHER.

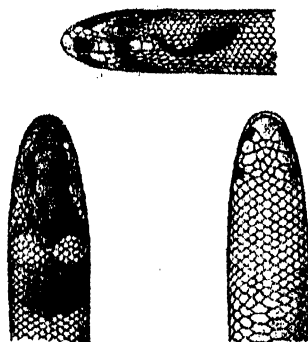
THE Lizard described here was discovered by H. N. Bailey, Esq., in the neighbourhood of Cue, a new township which has sprung up in the middle of the Murchison Gold-Field, some 200 miles from the coast. It was accompanied by a specimen of *Varanus caudolineatus* (Blgr.), which seems to be restricted to Western Australia, and is probably the smallest species of the genus.

Delma (*Cryptodelma*) *Baileyi*.

This species is allied to the type of the genus, *Cryptodelma nigriceps* (Fischer, Wieg. Arch. 1882, p. 290, Taf. i. figs. 5-9), from Nicol Bay, but distinguished by a considerably smaller number of longitudinal series of scales, viz. 22, whilst

the latter species is covered by 26 or 28. In other respects, especially general habitus and scutellation, the two species are very similar to each other.

The length of the tail exceeds that of the trunk and head. The rudimentary hind leg is small and flat, adpressed, and covered with scales, so as to be not readily distinguished from its surroundings.



Rostral shield broad and low. Nostril between three shields, the first labial, nasal, and internasal. The internasals meet behind the rostral, and form the foremost pair of the shields with which the snout is covered. The internasal pair is followed by two pairs of transversely narrow frontals, which, again, are succeeded by a single shield thrice as wide as long; the latter may be regarded as a detached portion of the vertical. Vertical five-sided, longer than broad, with the lateral margins parallel. Occipitals symmetrical, narrow, scarcely longer than vertical.

Two series of small scutes between the vertical and the eye, which is surrounded by a ring of very small scales. Loreal and temporal regions covered with scales. Seven upper labials. The mental is rather large and followed by two lower labials, none of which meet those of the other side. Behind the second lower labial two longitudinal series of small scutes follow.

Body surrounded by 22 longitudinal series of small scales: the ventral scutes are considerably larger than the adjoining scales and begin to be differentiated behind the throat; they are placed in 89 pairs. Eleven præanal pores. Vent with a pair of enlarged scutes; smaller scutes between them and the line of pores.

Yellowish olive, with a red network all over the back and sides; the meshes of the net enclose yellow spots on the sides.

Crown of the head and a broad crescentic band across the neck black. A pair of red spots separating the collar from the black crown. A black band descends from the eye to the infralabials. Lower parts whitish.

Total length 160 millim. Length of tail 90 millim.

This species would belong to Fischer's genus *Cryptodelma*, which has been separated from *Delma*, on account of the presence of præanal pores. However, a comparison of the allied species will show that this technical character leads to a rather unnatural subdivision of the genus.

XXII.—*Descriptions of new Species of Butterflies from the Pacific Islands.* By H. GROSE SMITH, B.A., F.E.S., F.Z.S.

Papilio oberon.

♂. *Upperside* brownish black; anterior wings crossed obliquely, at about one third from the apex, by a row of white spots arranged as in *P. ægeus*, Don., but the spot between the lowest subcostal and upper discoidal nervules is quadrate and not indented externally. Posterior wings with a brownish-white band of spots divided by the veins as in *P. ægeus*, but the inner edge of this band slightly invades the cell as in *P. ormenus*, Guér., and the outer ends are rather more indented and approach nearer the outer margins; above the anal angle is a large suboval brick-red spot.

Underside. Anterior wings as on the upperside; the oblique row of spots is broader and irrorated with grey on the inner side. Posterior wings with a row of six brick-red lunules crossing the disk from the submedian nervure to the apex, those nearest the anal angle the smallest, gradually increasing in size, the apical spot being the largest of them; another brick-red spot, larger than the last-named spot, is situate above the anal angle; inside the row of red spots are two rows of greyish markings, the outer of which consists of three narrow bluish-grey hastate lines between the submedian nervules, above which, divided by the veins, is a row of seven bars of grey scales, indented outwardly, those on either side of the uppermost median nervule being the broadest and most indented, the two bars nearest the apex nearly obsolete.

Expanse of wings $4\frac{1}{2}$ inches.

Hab. Santa Cruz (*Woodford*).

Very near *P. ægeus*, Don.

Stictoplasa melander.

♂. *Upperside* rich dark brown, with purple reflections over the anterior wings, on which are two small subapical violet spots (the spot nearest the apex the smaller), and four others, very minute, between the veins. Posterior wings with one small submarginal lilac spot below the second subcostal nervule, the space above the upper subcostal nervule to the inner margin pale brown.

Underside. Both wings dark brown, paler towards the outer margins. Anterior wings with the space above the submedian nervure and the costal margin pale brown; a triangular violet spot near the end of the cell and five others beyond the cell; one subapical small spot. Posterior wings with a violet spot near the end of the cell and eight others beyond the cell curving round it, the two nearest the inner margin being linear.

♀. *Upperside* pale brown, darker in the middle, with purple reflections on the anterior wings, on which is a violet spot near the end of the cell, and a little beyond it are five spots, three close together near the costa and the other two between the discoidal nervules; a submarginal row of violet spots, the first, third, and fourth of which are nearly obsolete. On the posterior wings the costal space becomes nearly white towards the apex, the outer fourth becomes very much paler to the margins.

Underside paler than above, becoming nearly white towards the outer margins, with all the spots larger and more distinct except the submarginal spots, which are nearly obsolete; the brands on the upperside of the male are represented by two long whitish streaks.

Expanse of wings, ♂ 2½, ♀ 2¼ inches.

Hab. Santa Cruz (Woodford).

Nearest to *S. melolo*, Doherty; the wings are comparatively shorter and rounder in the male, and the submarginal row of spots on the anterior wings are much smaller and less distinct, while the female is quite different.

Asthipa Meeki.

♂. *Upperside* scarcely differs from *A. melusine*, Grose Smith, but the subapical vitreous streaks on the anterior wings are more elongate than in that species.

On the *underside* the wings are browner and on the posterior wings the pale bands do not approach so closely to the base; the pale streaks below the subcostal nervules are also

more elongate; the submarginal row of spots of *A. melusine* are only represented by four spots near the apex.

It is a larger insect than *A. melusine*, but very close to it.

Expanse of wings $2\frac{1}{2}$ inches.

Hab. Fergusson Island (*Meek*).

Cupha fumosa.

♂. *Upperside*: both wings fuliginous dark brown, the cells and basal two thirds of the wings paler fuliginous brown; the anterior wings are crossed from the middle median nervule to the inner margin at one third from the outer margin by three ill-defined bright brown spots placed under each other between the veins. Posterior wings crossed beyond the cell by a similar row of spots, outside which is a row of very indistinct dark brown spots.

Underside with the basal three fourths paler fuliginous brown, without any transverse lines or markings; the outer fourth is darker purplish brown, the inner side of the outer fourth is crossed from near the costal to near the inner margin by a row of orange-brown spots, centred with black and nearly surrounded by pale violaceous brown; a pale submarginal dark line crowned by pale violaceous-brown lunules.

Expanse of wings 2 inches.

Hab. Kiriwini, Trobriands (*Meek*).

Doleschallia Comrui, Godm. & Salv.

♂. *Upperside*: both wings resemble *D. dascylus*, Godm. & Salv., in colour, but the basal third of each wing is darker chocolate-brown. Anterior wings with a row of spots across the disk arranged as in *D. dascylus*; the spots are eight in number, the two nearest the costal margin white and small; the next four spots are pale blue centred with white, the fourth spot being larger than the third; the fifth spot is very large and elongated on the outer and inner sides, the latter extending as far as the cell; the fifth spot is abbreviated inwardly, but is wider than the fourth; the seventh and eighth spots are much smaller and are situate further from the margin.

Underside scarcely distinguishable from *D. dascylus*.

Expanse of wings $3\frac{1}{4}$ inches.

Hab. Fergusson Island (*Meek*).

The presence of both sexes of this species in the same collection enables me to describe the male of *D. Comrui*, hitherto, I believe, undescribed. The female specimens in Mr. Meek's collection agree almost exactly with the figure

of *D. Comrii* ♀ in the 'Proceedings of the Zoological Society,' 1878.

My specimen of *D. dascylus* ♀, Godm. & Salv., does not agree with their description of that sex, the band on the anterior wings being browner and entirely divided across the discoidal nervules by an oblique broad black band. If my female specimen is correctly allocated to *D. dascylus*, of which I have little doubt, as it was accompanied by seven or eight males, it is clear that *D. dascylus* (which has been confounded with *D. Comrii*) is a distinct species, the female of which, as in my collection, remains to be described.

Hypolimnas palladius.

♂. *Upperside*: both wings dark velvety brown, anterior wings crossed halfway between the cell and the apex by a broad oblique band of five white spots, divided by the black veins and situate between the subcostal and the lowest median nervules. Posterior wings with an obscure orange-rufous patch near the anal angle, in which is placed a black spot centred with violet; a submarginal row of other black spots is faintly visible, centred with minute violet spots.

Underside. Anterior wings crossed by the white band, wider than on the upperside, and extending between the median nervules nearly to the outer margin; between the lowest median nervule and the submedian nervure is an obscure dark spot, centred with violet. Posterior wings like those of *H. pandarus*, Linn., but the submarginal row of whitish lines is almost obsolete, and the inner edge of the discal tawny band is bordered by an almost white irregular band, widest in the middle, and the middle black spot in the tawny band is small and not centred with white.

♀. *Upperside* paler brown, with the white band on the anterior wings broader than in the male and extending over the subcostal nervules towards the base; a small white spot towards the apex, and a similar spot below the lowest median nervule. Posterior wings with the disk crossed by a broad irregular band of white, narrowing and becoming obsolete towards the costal margin; below this band is a row of black spots centred with white, except the third and fourth spots, the two spots nearest the anal angle partly surrounded by dusky tawny, and the next two bordered outwardly by a whitish space irrorated with black scales; outer margin broadly dark brown, the inner edge of which is sinuate.

Underside paler than above; towards the apex of the anterior wings are three white dots, and the spot above the

submedian nervure is centred with white. On the posterior wings the discal row of spots is smaller than in *H. pandarus*.

Expanse of wings, ♂ $3\frac{3}{4}$, ♀ $3\frac{1}{2}$ inches.

Hab. Fergusson Island (*Meek*).

Nearest to *H. pandarus* and *H. Saundersi*, Wall.

Hypolimnast paleutes.

♂. *Upperside* resembles *H. deois*, Hew., but on the posterior wings the pale discal patch is more widely suffused by violaceous, and the outer edge of the patch is less acutely angulated in the middle; there is only a faint indication of the orange-tawny patch at the anal angle, and there is a distinct submarginal row of spots centred, except the fourth, with violet.

Underside darker than in *H. deois*; the anterior wings are without the pale space in the middle of the costal margin, and, instead of two indistinct pale lines parallel with the outer margin, there is only an indication of one line close to the margin. The posterior wings are dusky brown, except a narrow pale space inside the discal row of spots, which are six in number, centred with violaceous, more conspicuously than in *H. deois*, in which the black spots are centred with white dots; the two spots nearest the anal angle are partly surrounded by dusky tawny; only the spot above the upper median nervule is obsolete, and the row of pale lines near the outer margin of *H. deois* is absent.

♀. *Upperside* dusky brown; a very indistinct, almost invisible, oblique paler band crosses the wings beyond the cell; a white streak at the middle of the costa and a submarginal row of white dots across the disk between the veins, except on either side of the upper median nervule. On the posterior wings is a curved row of black spots across the disk, centred with white, of which the second and sixth are the largest and the fourth the smallest; inside the row of spots between it and the cell is a slight irroration of white scales.

Underside as above, but paler. On the posterior wings the discal row of spots, in which the central spots are much larger, is bordered on either side by a paler dusky space, and the dark outer marginal band is divided by a pale brown sinuate line, divided by the dark veins.

Expanse of wings, ♂ $3\frac{1}{4}$, ♀ $3\frac{1}{2}$ inches.

Hab. Kiriwini, Trobriands (*Meek*).

Parthenos thesaurinus.

♂. *Upperside* bright brown, less olivaceous than *P. thesaurus*, Mathew. Anterior wings: the apical portion nearly black, the brown streaks and markings becoming nearly obsolete; the submarginal brown bands are much narrower and the discal transverse band of spots is much whiter than in that species. On the posterior wings the three basal dark bands are narrower, the space between them being wider and the lunules in the submarginal band more conical in shape.

Underside browner than in *P. thesaurus*, especially on the posterior wings, in which the oblique band of obscure dusky bars which crosses the disk is brown instead of black, as in *M. thesaurus*, and the pale spaces on either side of the row of dark streaks below the band are less bluish grey and more tinged with brown.

Expanse of wings $2\frac{1}{2}$ inches.

Hab. Santa Cruz (Woodford).

This butterfly is considerably smaller than *P. thesaurus*, being nearly the same size as *P. aspila*, Honr.

Tenaris melanops.

♀. *Upperside* white; anterior wings with the lower third from the lowest median nervule, and thence across the cell to the costal margin, and the costal margin broadly to the apex fuliginous grey; the veins, except where crossed by the grey colour, are white. Posterior wings with the costal margin to the apex broadly grey, thence along the outer margin more narrowly grey, until that colour merges in the white lower part of the wings; on the disk, between the median nervules and a little on either side, is a very large diffused fuliginous greyish-black spot, in which, a little above its centre, is situate a large cluster of lavender-coloured scales; at the lower end of this cluster is a pure white spot, and near the outer edge of the black spot is another small lavender spot; near the apex is another small lavender spot surrounded by black. Towards the base the wings are clothed with long yellowish-brown hairs.

Underside. Anterior wings as on the upperside; posterior wings with two large fuliginous brown ocelli, one of which is situate on the margin near the apex and the other on the disk extending over the submedian nervules; both ocelli are centred by a white spot partially surrounded by a cluster of lavender-coloured scales, situate in a circular black zone; outside the zone is an indistinct fuscous ring, outside which,

still in the fuliginous brown area, is a minute white spot on each ocellus.

Expanse of wings 4 inches.

Hab. Sud Est, New Guinea (*Woodford*).

Nearest to *T. affinis*, Kirby.

Elymnias melanthes.

♂. *Upperside* dark fuliginous brown, slightly paler towards the apex of the anterior and the basal third of the posterior wings; on the anterior wings is a curved streak of fuliginous dark blue, slightly metallic, commencing on the costa a little above the end of the cell, but not extending to the apex or outer margin, and gradually fading towards the outer angle. The posterior wings are tinged with the same colour in the apical region, and there are two black spots centred with the same colour on the disk towards the anal angle; one of these spots is situate between the two lowest submedian nervules and is larger than the other spot, which is situate on the other side of that vein.

Underside dusky brown; anterior wings rather densely irrorated with pale scales beyond the cell and in the apical area, the posterior wings being also sparsely dusted with similar scales. Posterior wings with a large, irregular, oblong ovate, fulvous patch extending from a little beyond the middle submedian nervule to near the anal angle; in the patch are situate two large black spots, centred with blue spots, which are double in the lower spot; the fulvous patch is more oblique than in *M. agondas*, Boisd., and other allied species. Abdomen fulvous.

♀. Both wings white; anterior wings with costal margin broadly dusky brown, becoming broader at the apex, thence narrowing along the outer margin, and ceasing below the upper median nervule; inside the dusky brown apical area is a faint indication in certain lights of the blue metallic coloration of the male. Posterior wings with the costal and apical margins broadly dusky brown, which extends partly round the outer margin and becomes dusted with white scales towards the anal angle; there are two large diffused dusky spots towards the anal angle, much larger than in the male and centred with large blue spots, those in the lower spot being double; on the disk towards the apex is an indistinct streak of slightly metallic blue, corresponding with the like coloration of the male.

Underside white, with similar dusky brown marginal bands and veins of that colour; on the posterior wings the dusky

brown spots are represented by a large oblong ovate fulvous patch, in which are situate two black spots centred with blue as in the male.

Expanse of wings $3\frac{1}{2}$ inches.

Hab. Woodlark Island (*Meek*).

Nearest to *E. agondas*, *Boisd.*, and *E. glaucopsis*, *Stgr.*

Lampides epilectus.

♂. *Upperside* resembles *L. eclectus*, *Grose Smith*, but on the anterior wings the apex is more broadly greyish black, and on the posterior wings the blue area is more restricted.

Underside: scarcely differs from *L. eclectus*, but on both wings the outer marginal dark area is narrower, the central white area being correspondingly broader.

♀. *Upperside*: anterior wings differ from that sex of *L. eclectus* in having the basal blue area more vivid and extended, and the outer marginal dark area is narrower than in *L. eclectus*, and more broadly margined interiorly with blue.

Underside. The outer marginal dark area of the anterior wings is much narrower; on the posterior wings the inner row of obscure black markings which crosses the disk is situate further apart from the outer row and from the metallic blue lunules which crown the latter.

Expanse of wings $1\frac{1}{2}$ inch.

Hab. Fergusson Island (*Meek*).

Holochila lamia.

♂. *Upperside* resembles *H. absimilis*, *Feld.*, but slightly more violaceous; the cilia of the posterior wings are crossed with black at the ends of the veins.

Underside greyish silvery white, with the base of the wings pale greenish blue, which on the posterior wings extends over the basal fourth. Anterior wings with a grey line at the end of the cell and three dark grey lines across the disk, the outermost being on the margin and the two inner ones being sinuate, with the spaces between rather paler than the rest of the wings; in the interspaces between the veins near the outer margin is a row of hastate dark grey markings. The posterior wings are likewise crossed by three dark grey lines, with the interspaces paler than the basal portion of the wings; the outer line on the margin very narrow, the middle line very deeply indented inwardly, and the third line very sinuate; between the two outer lines is a row of spots resembling an inverted T; there is a fourth irregular line

crossing the wings a little beyond the cell and curving round it; two spots and a streak in the cell; one spot above and three spots below the cell nearer the base.

Expanse of wings $1\frac{1}{2}$ inch.

Hab. Fergusson Island (*Meek*).

Nearest to *H. absimilis*; on the underside it is quite distinct from that species.

XXIII.—On *Lepidoptera Heterocera* from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c.*

[Plates VI. & VII.]

THE following paper deals with species of *Heterocera* belonging to the families *Epicopiidae*, *Uraniidae*, *Epiplemidæ*, and *Geometridæ*. As, however, there are about nine hundred species in the latter family recorded from the region under consideration, it seemed advisable to divide the paper into two parts. In the present instalment, therefore, only the *Boarmiinae* subfamily of *Geometridæ* is referred to.

The arrangement of the list is based on the system of classification adopted by Sir George Hampson, Bart., in his work on Indian *Heterocera* ('Fauna of British India,' Moths, iii.), but in some instances Mr. Meyrick's revision of the *Geometrina* of the European fauna (*Trans. Ent. Soc. Lond.* 1892, pp. 53–140) has been followed.

Over one hundred and fifty of the species here enumerated have not, so far as I am aware, been previously described.

Family *Epicopiidae*.

Genus *EPICOPIA*.

(Westw. *Arc. Ent.* i. p. 17 (1845).)

— *Epicopia mencia*.

Epicopeia mencia, Moore, *Proc. Zool. Soc. Lond.* 1874, p. 578, pl. lxxvii. fig. 8.

I received specimens from Chang-yang, Kiukiang, Omeian, and Moupin, taken in June and July.

Hab. Central, Eastern, and Western China.

* [We are indebted to the Author for the two Plates and also for contributing largely towards the cost of the extra sheets of letterpress.]

Epicopia Hainesii.

Epicopeia Hainesii, Holl. Trans. Amer. Ent. Soc. xvi. p. 72 (Jan. 1889).

Epicopeia simulans, Leech, Proc. Zool. Soc. Lond. 1886, p. 611, pl. xxxi. fig. 1 (April 1886).

There were specimens from Oiwake and Hakone in Pryer's collection. My native collector captured examples at Hakodate in June and July, and I have received the species from Ichang.

Var. *sinicaria*.

Differs from the type in being fawn-coloured and in the absence of first crimson marginal spot on secondaries.

Five female specimens from Ichang, taken in June.

Distribution. Japan; Central China.

Var. *sinicaria* appears to mimic the pale female form of *Papilio mencius*.

— *Epicopia philenora*.

Epicopeia philenora, Westw. Arc. Ent. i. p. 19, pl. v. fig. 2 (1843).

Epicopeia varunæa, Moore, Proc. Zool. Soc. Lond. 1865, p. 799.

Epicopia philenora, Hampson, Fauna Brit. Ind., Moths, iii. p. 109 (1895).

One female specimen of the *varunæa* form from Moupin, taken in July.

Distribution. Sikhim; Assam (*Hampson*); Western China.

Family Uranidae.

Genus ACROPTERIS.

(Hübner, Hampson, Fauna Brit. Ind., Moths, iii. p. 114 (1895).)

— *Acropterus iphiata*.

Micronia iphiata, Guen. Phal. ii. p. 29 (1857).

Micronia pontiata, Guen. l. c.

Acropterus iphiata, Hampson, Fauna Brit. Ind., Moths, iii. p. 116 (1895).

There were specimens from Yokohama in Pryer's collection; I met with the species at Nagasaki, Fushiki, and Gensan in July, and have received it from Kiukiang, Ichang, Chang-yang, and the province of Kwei-chow.

Distribution. Himalayas; Khâsis; Burma (*Hampson*); Japan; Eastern, Central, and Western China.

Genus PSEUDOMICRONIA.

(Moore, Lep. Ceyl. iii. p. 461 (1887).)

— *Pseudomicronia archilis*.*Micronia archilis*, Oberth. Etud. d'Entom. xv. p. 23, pl. iii. fig. 33 (1891).*Pseudomicronia archilis* (sror), Alph. Rom. sur Léop. vi. p. 53, pl. iii. fig. 1, ♀ (1892).

This species, which was discovered by Mons. Biet at Tachien-lu, was obtained by my collectors in most of the localities they visited in Western China. Alphéraky records it from the province of Kan-Sou, July.

In one form, which so far has been received only from Moupin, the ground-colour and that of all the markings is suffused with brownish.

Hab. Western China.

Genus MICRONIA.

(Guenée, Phal. ii. p. 22 (1857).)

— *Micronia aculeata*.*Micronia aculeata*, Guen. Phal. ii. p. 26, pl. xiii. fig. 8 (1857); Hampson, Fauna Brit. Ind., Moths, iii. p. 117 (1895).*Micronia gannata*, Guen. l. c.

One specimen was received from Huang-mu-chang, where it was taken in July, and I captured one example at Foochau in April.

Distribution. Throughout India, Ceylon, and Burma; Andamans; Java; Borneo; Formosa (*Hampson*); Western China; Foochau.

Genus AUZEA.

(Walker, Cat. Lep. Het. xxv. p. 1487 (1862).)

Auzea obliquaria, sp. n.

Pale brownish grey, tinged with violaceous. Primaries have a fine oblique brown line, angled below costa, before the middle, and a broad oblique olivaceous-brown line from apex to about the middle of the abdominal margin of secondaries; there is a whitish patch sparingly irrorated with fuscous on the costa before apex; this is preceded by an olivaceous-brown cloud, and has a small spot of the same colour on its outer edge. Under surface orange freckled with fuscous: primaries are suffused with purplish grey on the disk, and have a yellowish patch on costa towards apex; a pale oblique line

edged inwardly with blackish from apex: secondaries have two purplish-grey transverse lines.

Expanse 44 millim.

Two female specimens from Chang-yang, June and July.

Hab. Central China.

Family Epiplemidæ.

Genus DECETIA.

(Walker, Cat. Lep. Het. xx. p. 232 (1860).)

Decetia numicusaria.

Decetia numicusaria, Walk. Cat. Lep. Het. xx. p. 95; Hampson, Fauna Brit. Ind., Moths, iii. p. 122 (1895).

I received a specimen from Moupin and one from Omei-shan; both were taken in July.

Distribution. Sylhet (Hampson); Western China.

Decetia violacearia, sp. n.

Violet-grey, suffused with brown on the costa and also on the outer marginal area beyond the darker brown oblique line which runs from near apex of primaries to middle of abdominal margin of secondaries; this line is inwardly edged with pale violet; a blackish discal dot on each wing: the primaries have indications of a wavy dusky line before the middle; fringes brown. Under surface similar to above, but the portion within the oblique line is paler on all the wings.

Expanse 36 millim.

One female specimen from Omei-shan, July.

Hab. Western China.

Decetia argentilinearia, sp. n.

Olivaceous brown. Primaries have an oblique silvery-grey line, angulated below costa and slightly elbowed inwards above the inner margin; between this line and the base of the wing there are two or three finer wavy and angulated lines; outer marginal area golden brown, with an upright dark brown bar on inner margin: secondaries have two silvery-grey transverse lines on central area and three wavy diffuse lines of the same colour on the outer marginal area, the outermost being on the margin itself. Under surface olivaceous grey; apical third of primaries pale golden, and there is a tinge of the same colour on the outer margin of secondaries. Antennæ pectinated.

Expanse 38 millim.

Two male specimens taken by my native collector at Hakodate in June or July.

Hab. Yesso.

—*Decetia lilacinaria*, sp. n.

Fuscous brown. Primaries speckled with lilacine atoms and suffused with golden brown on outer marginal area; there are two faint lilacine transverse lines, the outer one angled below costa, continued across the secondaries to middle of the margin, where it terminates in a patch of golden brown, and is outwardly bordered with the same colour; discal spot black. All the wings have indications near the inner margin of a dark submarginal band; fringes brown, tipped with greyish and preceded by an interrupted lilacine line. Under surface pale brown, darker towards outer margin; each wing has a dusky double transverse line and a black discal spot; the costa of primaries is edged with pale ochreous, especially towards apex, and there is a large golden-brown patch on outer margin of these wings; the apex of primaries is much produced.

Expanse 40 millim.

One male specimen from the summit of Omei-shan, taken in July.

Hab. Western China.

Genus PARADECETIA.

(Swinhoe, Trans. Ent. Soc. Lond. 1894, p. 164.)

—*Paradecetia albistellaria*.

Decetia albistellaria, Walk. Cat. Lep. Het. xvi. p. 1522 (1862).

Two male specimens from Ta-chien-lu and two examples of each sex from Chang-yang.

Distribution. Khásis; E. Pegu; Shán States (*Hampson*); Central and Western China.

Genus EPIPLEMA.

(Herr.-Schäffer; *Hampson*, Fauna Brit. Ind., Moths, iii. p. 125 (1895).)

—*Epiplema moza*.

Erosia moza, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 402 (1878); Ill. Typ. Lep. Het. iii. p. 42, pl. li. fig. 7 (1879).

The specimens in Pryer's collection were from Yokohama. I took the species at Nagasaki in May and Gensan in July, and have received it from Chang-yang and Omei-shan, July.

Distribution. Japan; Corea; Central and Western China.

Epiplema morataria, sp. n.

Allied to *E. moza*, Butl., with which it agrees very nearly in marking, but differs very greatly from that species in the contour of the wings. The angle at middle of outer margin of primaries is more pronounced, and there is a very conspicuous lobe at inner angle; both tails of secondaries are longer and thicker.

The transverse lines of primaries are more decidedly angled, especially the first one, and the dark spot on inner margin is almost square and hardly extends beyond the second line. On the secondaries the second transverse line is bordered inwardly with dusky and edged outwardly by a pale reddish-brown line; it is obtusely angled. There is a dusky submarginal line. Under surface fuscous grey, irrorated with brown.

Expanse 34 millim.

One female specimen from Moupin, July.

Hab. Western China.

Epiplema cretacea.

Erosia cretacea, Butl. Trans. Ent. Soc. 1881, p. 414.

There was a male specimen in Pryer's collection and I took a female example at Shimonoseki in July. Butler's type was from Tokio.

Hab. Japan.

Epiplema styx.

Erosia styx, Butl. Trans. Ent. Soc. 1881, p. 416.

Specimens from Oiwake and Fujisan in Pryer's collection. Types from Yokohama.

Hab. Japan.

—*Epiplema himala*.

Erosia himala, Butl. Ann. & Mag. Nat. Hist. (5) vi. p. 221 (1880); Ill. Typ. Lep. Hist. vi. p. 47, pl. cxii. fig. 9 (1886); Alph. Rom. sur Lep. vi. p. 62 (1892).

Epiplema himala, Hampson, Fauna Brit. Ind., Moths, iii. p. 181 (1895).

Erosia nuroguttata, Pouj. Ann. Soc. Ent. Fr. 1896, p. 811, pl. vi. fig. 11.

Several specimens were received from Chang-yang and also from various localities in Western China, July and August.

Alphéraky records the species from the province of Szechuen (taken in August) and Poujade from Moupin.

Distribution. Sikkim; Khásia (Hampson); Central and Western China.

— *Epiplema schidacina*.

Erosia schidacina, Butl. Trans. Ent. Soc. 1881, p. 415.

Specimens in Pryer's collection from Oiwake. I met with the species at Hakodate in August, and I have received examples from Omei-shan, Chia-ting-fu, Ta-chien-lu, and Pu-tsu-fong, taken in June and July.

Distribution. Japan; Yesso; Western China.

— *Epiplema instabilata*.

Erosia instabilata, Walk. Cat. Lep. Het., Suppl. xxxv. p. 1646 (1866).

Dirades conchiferata, Moore, Lep. Ceyl. iii. p. 403, pl. clxxxvi. fig. 11 (1887).

Epiplema instabilata, Hampson, Fauna Brit. Ind., Moths, iii. p. 131 (1895).

Three specimens taken at Ningpo by a native collector in July. Two examples were received from Ichang, taken in June and July.

One specimen from Ningpo has the fore wings entirely whitish, with a small black discal spot.

Distribution. India; Ceylon; Solomon Islands; China.

Epiplema plagifera.

Erosia plagifera, Butl. Trans. Ent. Soc. 1881, p. 414.

There were specimens from Yokohama and Gifu in Pryer's collection. I took the species at Foochau in April and in Satsuma in May.

Distribution. Japan; Eastern China.

— *Epiplema bicaudata*.

Erosia bicaudata, Moore, Proc. Zool. Soc. Lond. 1867, p. 643, pl. xxxiii. fig. 12.

One specimen taken by my native collector at Ningpo in June. I received two specimens from Ichang, one from Wassu-kow, and several from Omei-shan and Moupin, taken in June and July.

Distribution. Dharmasala; Sikhim; Khâsis (Hampson); North, Central, and Western China.

Epiplema nubifasciaria, sp. n.

Creamy white, slightly suffused with blackish on basal two thirds. Primaries have a black-edged brown band beyond the middle, and this is followed by a large irregular blackish-grey cloud, which occupies all but the apical portion

of the outer marginal area and has a slightly curved black bar on its external edge: secondaries have the basal area marked with blackish; central band and cloud beyond similar to those on primaries; discal spot elongate, black. Under surface white; primaries have a large blackish patch on basal half, but this does not extend to inner margin; a narrow blackish band just beyond the middle of the wing, separated from a broader band of the same colour by a narrow space of the ground-colour; secondaries have a blackish discal mark and small blackish spots on basal area, and some large ones and a cloud on outer marginal area.

Expanse 20 millim.

One male specimen from Chang-yang, August.

Hab. Central China.

Closely allied to *E. bicaudata*, Walk.

Epiplema rapha.

Erosia rapha, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 403 (1878); Ill.

Typ. Lep. Het. iii. p. 42, pl. li. fig. 5 (1879).

Several specimens from Oiwake in Pryer's collection. I obtained one example at Hakodate in July.

Hab. Japan and Yesso.

Genus GATHYNIA.

(Walk.; Hampson, Fauna Brit. Ind., Moths, iii. p. 184 (1895).)

Gathynia fasciaria, sp. n.

Primaries brownish, with a darker central fascia, which is indented on its inner edge and bordered with ochreous: secondaries rather darker than primaries, with a dark brown dot on abdominal area towards the base, and a dark brown central transverse line outwardly edged with ochreous; fringes dark grey. Under surface fuliginous grey.

Expanse 18 millim.

One female specimen from Gensan, July.

Hab. Corea.

Genus ATOSSA.

(Moore, Proc. Zool. Soc. Lond. 1874, p. 577.)

— *Atossa neloinna*.

Atossa neloinna, Moore, Proc. Zool. Soc. Lond. 1874, p. 577, pl. lxvii. fig. 7; Elwes, P. Z. S. 1890, p. 381, pl. xxxiv. fig. 1, ♂.

Atossa neloynna, var. *chionensis*, Leech, Entom. xxiii. p. 83 (1890).

I have a male specimen of this species from Wa-shan, a

female from Chang-yang, and two females from Omei-shan, May, June, and July.

Distribution. N.W. Himalayas (*Hampson*); Central and Western China.

— *Atossa Leechi*.

Atossa Leechi, Elwes, Proc. Zool. Soc. Lond. 1890, p. 381.

A male specimen was received from Huang-mu-chang, one from Omei-shan, another and also a female from Moupin, June and July.

Hab. Western China.

Both these species of *Atossa* exhibit considerable resemblance to *Delias patrua*, Leech, a butterfly occurring in the same localities.

The characters given by Mr. Elwes as separating this species from *A. nelsonna* appear to be constant.

— Genus OBERTHÜRIA, nov.

Palpi porrect, hairy, extending beyond head. Antennæ fasciculate. Primaries with vein 5 from just above the middle of discocellulars, 6 and 7 stalked, as also are 8, 9, and 10. Secondaries with two internal veins and 5 from just above the middle of discocellulars. Outer margin of all the wings rounded; costa of primaries arched at the base.

Type *O. Davidi*.

— *Oberthüria Davidi*.

Abraxas Davidi, Oberth. Ann. Soc. Ent. Fr. 1885, p. cccxix; Etud. d'Entom. xi. p. 33, pl. iii. fig. 16 (1886).

Five male specimens from Moupin and one from Chia-ting-fu, July.

Hab. Western China.

— *Oberthüria flavomarginaria*, sp. n. (Pl. VI. fig. 7.)

Closely allied to *A. Davidi*, but differing from that species in having much broader and richer yellow borders to all the wings; these borders are traversed by a series of black spots and are inwardly limited by narrower black bands, the black marginal spots are rounder and exhibit less tendency to confluence; the costal area is more deeply yellow and more finely speckled with black; on the secondaries there is no black transverse bar at end of discal cell and the abdominal margin is not suffused with blackish; the body is yellower.

Expanse 50–58 millim.

Three male specimens from Wa-shan, June.

Hab. Western China.

Oberthürria nigromacularia, sp. n. (Pl. VI. fig. 6.)

White; the costa and outer margin of primaries are broadly yellow, the former dotted with black, the latter traversed by two series of black spots and bordered inwardly by a third series; there is an interrupted macular central band, and from this to the inner margin there is a series of five black spots bordering the yellow costal stripe: secondaries are black at the extreme base of the wing, and have large black spots placed as follows:—two confluent about the centre of the wing, a longitudinal series above them, and three contiguous rows on the outer marginal area; the ground between some of these latter is tinged with yellowish. Fringes of primaries black, marked with yellow towards inner angle; of secondaries white. Under surface as above, but the rows of spots on outer marginal area of secondaries are smaller and more distinctly separated. Body yellow, marked with black.

Expanse 50 millim.

Two male specimens from Chang-yang, July.

Hab. Central China.

The black discal markings, absence of yellow border to secondaries and of black on the nervation at once separate this species from either *A. Davidi* or *A. flavomarginaria*.

Genus *PSYCHOSTROPHIA*.

(Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 401 (1877).)

Psychostrophia melanargia.

Psychostrophia melanargia, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 401 (1877); Ill. Typ. Lep. Het. ii. p. 9, pl. xxiii. fig. 7 (1878); Leech, Proc. Zool. Soc. Lond. 1888, p. 612.

There were specimens in Pryer's collection from Nikko and Fujisan. I obtained the species at Tsuruga in July.

Hab. Japan.

— *Psychostrophia nymphidiaria*.

Abraxas nymphidiaria, Oberth. Etud. d'Entom. xviii. p. 84, pl. ii. fig. 28 (1898).

Not uncommon at Chang-yang; Ichang; Moupin; Wushan, Ta-chien-lu, and Chia-kou-ho. June and July.

Hab. Central and Western China.

Psychostrophia picaria, sp. n. (Pl. VI. fig. 11.)

Male.—Primaries black, with a broad oblique central fascia extending from inner margin to outer extremity of discal cell,

Ann. & Mag. N. Hist. Ser. 6. Vol. xix. 14

indented on its upper edge and represented on apical area by an oval spot; below the latter there is a submarginal series of four round spots, also white: secondaries white, with a black central band and a black border on outer margin. Fringes black, marked with white below apex of primaries and just above the middle of secondaries. Under surface as above, but the costa is streaked with yellowish.

Female.—Similar to the male, but the white markings of primaries are wider and the black one of secondaries is narrower.

Expanse, ♂ 33–43, ♀ 45–47 millim.

A long series from Chang-yang and one female specimen from Ichang, June.

Hab. Central China.

The white band on primaries and the black on secondaries are variable in width.

Family Geometridæ.

Subfamily *BOARMIINÆ*.

(Hampson, *Fauna Brit. Ind., Moths*, iii. p. 139 (1895).)

Genus *URAPTERYX*.

(Leech; Hampson, *op. cit.* p. 144.)

Urapteryx sambucaria.

Phal. Geometra sambucaria, Linn. *Syst. Nat.* x. p. 519.

Urapteryx persica, Mén. *Cat. Mus. Pet.* p. 267 (1832).

† *Urapteryx nivea*, Butl. *Journ. Linn. Soc., Zool.* xvii. p. 199 (1893).

I took specimens of the var. *persica* in Satsuma in May and at Nagasaki in June. This form is whiter than the type, but it can hardly be called smaller. One of the Satsuma examples expands 68 millim. I did not meet with the species in any other part of Japan, and there were no specimens in Pryer's collection. My native collector obtained the species in the island of Kiushiu.

I received specimens of the type form and also of var. *persica* from Pu-tau-fong and Omei-shan, but the variety only was obtained in the province of Kwei-chow. The typical specimens from China are rather more striated than is the case in European examples.

Distribution. Europe; Armenia; Amur; Japan; Western China.

— *Urapteryx latimarginaria*, sp. n.

White; the markings on primaries are somewhat similar

to those of *U. costistrigaria*, but the bands, which are fuliginous grey in colour, are narrower, and there are fewer streaks on the costa, and these are confined to the basal area with the exception of a streak between the first transverse band and the short central band; on the outer area of the wing there is a fuliginous grey band, which is very broad towards apex, but tapers slightly to the first median nervule, whence it is continued in slender streaks to inner angle: on the secondaries the transverse band is also narrower and the cloud on outer area is greyish and suffused with paleochreous. Above the tail, which is rather broader and more obtusely produced, there is a large reddish spot, and below it another spot of the same colour; both are ringed with black, and there is an elongated black spot nearer the anal angle. Under surface: markings of upperside reproduced, but the central bands are fainter and narrower and that on outer area much darker; the secondaries have some dark grey shading along outer margin.

Expanse 68 millim.

One male example from Omei-shan, June.

Hab. Western China.

— *Urapteryx costistrigaria*, sp. n.

White; primaries traversed by two rather broad oblique brownish bands, becoming blackish towards costa; a shorter and narrower band, between them, commencing in a darker spot on costa and terminating in first median interspace; basal area of costa streaked with dark brown; these streaks are short near the base, but the outermost extend almost to submedian nervure; the outer third is heavily striated and clouded with fuliginous; the costa between the broad bands is also streaked with brownish; fringes brown from apex to just above termination of submedian nervure, and thence white, except where interrupted by continuation of the broad transverse bands: secondaries traversed by an oblique brownish band from fork of subcostal nervure to a large cloud of the same colour on outer area; the abdominal area of the wing is clothed, except towards anal angle, with long silky hairs of a creamy colour; above the tail, which is obtusely produced, there is a reddish spot ringed with black, and below it there is an elongated blackish mark; fringes fulvous brown, except at costal and anal angles. Head snowy white; face brown; collar creamy. Under surface white, discal markings on upper surface of primaries faintly reproduced; outer area broadly fuliginous as far as submedian nervure; the second-

aries are without markings, except on the anal half of outer area in one specimen, where there are some fuliginous streaks and shading.

Expanse 68 millim.

Two male specimens from Omei-shan, taken in June.

Hab. Western China.

— *Urapteryx ebuleata*.

Urapteryx ebuleata, Guen. Phal. i. p. 32 (1857); Hampson, Fauna Brit. Ind., Moths, iii. p. 145 (1895).

Occurs in July at Pu-tsu-fong, Omei-shan, Kia-ting-fu, and Wa-shan; also at Chang-yang, in June and July.

The specimens, among which are examples of the larger *multistrigaria* form, appear to differ chiefly from *U. sambucaria*, var. *persica*, in being more heavily striated, and may possibly be only extreme forms of that variety.

Hampson (Fauna Brit. Ind., Moths, iii. p. 145) considers *kantalaria*, Feld., *multistrigaria*, Walk., and *Yerburii*, Butl., to be synonymous with *U. ebuleata*. Alphéraky (Rom. sur Lép. vi. p. 52) notes one female specimen of *U. Yerburii* from the province of Szechuen, taken in August.

Distribution. Central and Western China; mountains of Northern India.

— *Urapteryx similaria*, sp. n. (Pl. VI. fig. 3.)

In size and general appearance closely resembles *E. maculicaudaria*, Motsch., but the antennæ of the male are not pectinated, and in both sexes the line on secondaries is straight and the tails rather more prolonged and ornamented with a red and a black spot, the black one being the smaller. In the female the central band on secondaries is interrupted, its lower extremity being represented by a spot.

Expanse, ♂ 50, ♀ 47 millim.

Two specimens, a male from Omei-shan and a female from Chang-yang, July.

Hab. Central and Western China.

Urapteryx subpunctaria. (Pl. VI. fig. 2.)

Urapteryx subpunctaria, Leech, Entom., Suppl. p. 42 (May 1891).

Tristrophia obtusicauda, Warren, Novit. Zool. i. p. 309 (1894).

Two specimens from Oiwake in Pryer's collection.

Superficially resembles *E. maculicaudaria*, Motsch., but the antennæ of the male are not pectinated and the arrangement of the lines above and the spot on the secondaries beneath are dissimilar.

Hab. Japan.

— *Urapteryx kernaria*.

Urapteryx kernaria, Oberth. Etud. d'Entom. xviii. p. 23, pl. ii. fig. 20 (Nov. 1893).

This species was discovered in Western China at Tsé-kou by R. P. Dubernard; my collectors did not meet with it.

— Genus EUOTENURAPTERYX.

(Warren, Novit. Zool. i. p. 899 (1894).)

Euctenurapteryx maculicaudaria.

Acæna maculicaudaria, Motsch. Bull. Soc. Nat. Mosc. 1866, i. p. 196.

Euctenurapteryx maculicaudaria, Warren, Novit. Zool. i. p. 399 (1894).

Urapteryx luteiceps, Feld. Reis. Nov., Lep. v. pl. cxxii. fig. 2 (1875).

A series from Yokohama and Oiwake in Pryer's collection. I took specimens at Tsuruga in July and at Hakodate in August.

Among the specimens in Pryer's collection is a remarkable female aberration from Yokohama, in which the usual white colour is replaced by pale greyish brown; the transverse lines are, in consequence of the ground-colour, indistinct, but they are more ferruginous in colour, as also are the fringes and the spots at angle of the secondaries.

Distribution. Japan; Yesso; Eastern China.

Euctenurapteryx parallelaria.

Urapteryx parallelaria, Leech, Entom., Suppl. p. 5 (Jan. 1891).

I have one female specimen which was taken by a native collector at Chang-yang.

Hab. Central China.

— *Euctenurapteryx nigrociliaria*.

Urapteryx nigrociliaris, Leech, Entom., Suppl. p. 5 (Jan. 1891).

Appears to be not uncommon at Huang-mu-chang, in July. It also occurs at Omei-shan and in the province of Kweichow in June.

Hab. Western China.

Genus THINOPTERYX.

(Butl. Journ. Linn. Soc., Zool. xvii. p. 202 (1883).)

— *Thinopteryx crocoptera*.

Urapteryx crocoptera, Koll. Hüg. Kasch. iv. p. 483 (1848).

Thinopteryx striolata, Butl. Journ. Linn. Soc., Zool. xvii. p. 202 (1883).

Thinopteryx crocoptera, Hampson, Fauna Brit. Ind., Moths, iii. p. 148 (1895).

I obtained this species at Nagasaki and in Satsuma in May, at Gensan in July, and I have received specimens from various localities in Central and Western China. There were some examples from Kintokisan and Nikko in Pryer's collection.

It is very variable, and I have intergrades between the typical form and *striolata*, Butl. One specimen has three purple-brown spots on primaries, and a patch of the same colour on secondaries; there is a similar specimen in the series of *T. crocoptera* from Dharmasala in the National Collection at South Kensington.

Distribution. Japan; Corea; North, Central, and Western China; North India.

× *Thinopteryx prætoraria*.

Urapteryx prætoraria, Feld. Reise Nov., Lep. v. pl. cxxii. fig. 13 (1875).

One female example taken at Omei-shan, Western China, in July.

This specimen seems very distinct from *T. crocoptera*, Koll.

Distribution. Sylhet, Western China.

— *Thinopteryx delectans*.

Urapteryx delectans, Butl. Ill. Typ. Lep. Het. ii. p. 45, pl. xxxv. fig. 2 (1878).

Several specimens from Fujisan, Ohoyama, and Nikko in Pryer's collection. I have examples from Ichang, Changyang, Wa-shan, Omei-shan, and the Provinces of Kwei-chow, taken in June and July.

The yellow marking in this species is subject to variation; in typical specimens the wings are thickly sprinkled with yellow, whilst in other examples the yellow is confined to the median area and outer margin.

Distribution. Japan; North, Central, and Western China.

Genus SIRINOPTERYX.

(Butl. Journ. Linn. Soc., Zool. xvii. p. 201 (1863).)

— *Sirinopteryx rufivinctata*.

Urapteryx rufivinctata, Walk. Cat. Lep. Het. xxvi. p. 1747 (1862).

Sirinopteryx rufivinctata, Hampson, Fauna Brit. Ind., Moths, iii. p. 147 (1895).

Several specimens from Moupin, and one example from Changyang, July.

Distribution. Northern India; Central and Western China.

Genus TRISTROPHIS.

(Butl. Journ. Linn. Soc., Zool. vii. p. 199 (1883).)

— *Tristrophis veneris*.

Urapteryx veneris, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 392 (1878);
Ill. Typ. Lep. Het. iii. p. 29, pl. xlviii. fig. 1 (1879).

A fine series from Yokohama and Nikko in Pryer's collection.

The transverse bands of primaries vary in width and the black spots on disk of secondaries are inconstant both as regards size and number.

Hab. Japan.

Genus MYRTETA.

(Walk. Cat. Lep. Het. xxiii. p. 831 (1861).)

— *Myrteta sinensaria*, sp. n. (Pl. VI. fig. 13.)

Near to *M. planaria*, Walk., but rather whiter in the ground-colour; outer third of primaries more heavily suffused and the three transverse lines approach nearer to each other toward inner angle; the three blackish spots towards anal angle of *M. planaria* are in *M. sinensaria* replaced by a sinuate black line, and the two submarginal spots are represented by a blotch.

Expanse 46 millim.

One male example from Moupin, July.

Hab. Western China.

Myrteta angelica.

Myrteta angelica, Butl. Trans. Ent. Soc. 1881, p. 413.

Two specimens from Yokohama in Pryer's collection.

I captured the species at Oiwake in October.

Hab. Japan.

— *Myrteta tripunctaria*, sp. n.

Very near to *M. angelica*, Butl., but whiter, and the three transverse lines of primaries are narrower and more oblique; on the outer edge of the yellow patch at anal angle of secondaries there are three black spots, the middle one the largest, and a short indented black line on its inner edge. On the under surface the neuration is dark coloured; the outer marginal area of primaries is broadly blackish, preceded by a blackish line, and the basal area is suffused with the same colour; above the three blackish spots on outer margin of secondaries there is a blackish patch; submarginal line

blackish, indented above anal angle. Except at anal angle the line at base of the fringes of secondaries is blackish instead of light brown, as in *M. angelica*, and the antennæ are more broadly pectinated than in that species.

Expanse 44 millim.

One male specimen from Moupin, July.

Hab. Western China.

— *Myrteta sericea*.

Orthocabera sericea, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 439 (1879).

Orthocabera brunneiceps, Warren, Proc. Zool. Soc. Lond. 1893, p. 387, pl. xxxi. fig. 23.

Myrteta sericea, Hampson, Fauna Brit. Ind., Moths, iii. p. 152 (1895).

Four specimens from Nikko in Pryer's collection.

Distribution. Sikhim; Khásis (*Hampson*); Japan.

Myrteta unio.

Acidalia unio, Oberth. Etud. d'Entom. v. p. 50, pl. ix. fig. 12 (1880).

Cabera magna, Butl. Trans. Ent. Soc. 1881, p. 416.

One female specimen in Pryer's collection and I received one example of the same sex from Mr. Manley of Yokohama.

Distribution. Askold; Japan.

Myrteta argentaria, sp. n.

Silvery white. Primaries have a blackish discal spot and are traversed by three dusky bands, the first of which is rather more oblique than the others; submarginal line dusky, parallel with outer margin except towards inner margin, where it terminates close to the inner angle; marginal band dusky. Secondaries have a blackish discal spot and two wavy dusky bands; submarginal band dusky, diffuse on its inner edge; the middle of outer margin is slightly angled and there is a black spot on the angle. Fringes tinged with greyish. Under surface white; all the wings have a black discal spot, and the secondaries have a diffuse dusky submarginal band; in some specimens the primaries also have traces of a dusky submarginal band. Antennæ serrated.

Expanse, ♂ 46, ♀ 48 millim.

Three male specimens and three females from Omei-shan, Pu-tsu-fong, Chia-ting-fu, July.

Hab. Western China.

Genus *BAPTA*.

(Steph. Ill. Brit. Ent., Haust. iii. p. 294 (1829).)

Bapta bimaculata.

Phalena bimaculata, Fabr. Syst. Ent. 635 (1775).

Geometra taminata, Hübn. Geom. fig. 90.

Pseudopanthera bimaculata, Meyrick, Trans. Ent. Soc. 1892, p. 117.

Bapta subnotata, Warren, Novit. Zool. ii. p. 127 (1895).

I took specimens at Gensan in June and there were a few examples in Pryer's collection from Oiwake. My native collector obtained the species at Hakodate.

Distribution. Europe; Altai; Japan; Yesso; Corea.

Bapta punctata.

Phalœna punctata, Fabr. Syst. Ent. 637.

Geometra tenerata, Hübn. Geom. fig. 91.

Pseudopanthera punctata, Meyrick, Trans. Ent. Soc. 1892, p. 117.

Athena sancta, Butl. Trans. Ent. Soc. Lond. 1881, p. 413.

There were a few specimens from Oiwake in Pryer's collection, and I received examples from Hakodate taken in June.

Two of the specimens from Oiwake and one from Hakodate are slightly suffused with pale greyish, with the markings more or less obliterated, and are almost identical with an example from Germany in my collection. On the other hand, a specimen from Oiwake has the markings as dark and well defined as any in my European series.

Distribution. Europe; Ural; Amur; Japan; Yesso.

Bapta mytylata.

Corycia mytylata, Guen. Phal. ii. p. 58 (1857).

Bapta mytylata, Hampson, Fauna Brit. Ind., Moths, iii. p. 155 (1895).

There was a series from Oiwake and Yesso in Pryer's collection. I received a specimen from Wa-shan, taken in June, one from Huang-mu-chang and one from the Province of Kwei-chow, taken in July.

Distribution. N.W. Himalayas; Thundiāni; Punjab; Sikhim; Khâsis (*Hampson*); Japan; Yesso; Western China.

Bapta faddata.

Bapta faddata, Warren, Novit. Zool. i. p. 404 (1894).

Warren describes this species from Japan.

I have one male specimen from Chang-yang and four females from Ta-chien-lu, taken in June and July.

Differs from *B. mytylata*, Guen., in having the upper surface more densely powdered with fuscous, and in the discal area of under surface of primaries being suffused with fuscous.

Distribution. Japan (*Warren*); Central and Western China.

Bapta platyleucata.

Acidalia platyleucata, Walk. Cat. Lep. Het., Suppl. xxxv. p. 1626 (1896).

Bapta platyleucata, Hampson, Fauna Brit. Ind., Moths, iii. p. 155 (1895).

Three specimens from Pu-tsu-fong, taken in June and July.

Distribution. Kashmir; Sikkim; Khásis (*Hampson*); Western China.

Bapta sacra.

Corycia sacra, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 404 (1878); Ill. Typ. Lep. Het. iii. p. 44, pl. li. fig. 11 (1879).

Specimens from Yokohama in Pryer's collection.

I captured this species in Satsuma and at Nagasaki in May, at Gensan in June, and Mr. Smith took examples at Hakone in August. My native collector also obtained specimens in the latter month at Hakodate. Specimens have been received from Ichang and Omei-shan, taken in July.

Distribution. Japan; Yesso; Corea; Central and Western China.

Bapta candidaria, sp. n.

Male.—White, with a black discal dot on each wing. Primaries traversed by two dusky macular bands; the secondaries have one macular band. Under surface white; primaries slightly suffused with fuscous on basal two-thirds, and traversed by a dusky band which does not extend to inner margin; all the wings have a black discal dot.

Female.—Similar to the male, but the transverse markings are more distinct; there is a series of black dots on the outer margin of both surfaces of each wing, and the secondaries have a macular band on the under surface.

Expanse ♂ 30, ♀ 34 millim.

One example of each sex from Oiwake in Pryer's collection.

Hab. Japan.

Allied to *B. sacra*, Butl.

Bapta nigropunctaria, sp. n.

Silvery white powdered with fuscous. All the wings have dusky postmedial and submarginal bands and a blackish discal spot. Primaries have an elongate velvety black spot on costa just before the apex; costa pale brown. Fringes silvery, preceded by a pale brown line. Under surface

silvery white, faintly suffused with fuscous-grey, except on inner marginal area of primaries; fringes tipped with fuscous.

Expanse 36 millim.

Two male specimens. Moupin and Ta-chien-lu. July.

Hab. Western China.

- *Bapta distans*.

Bapta distans, Warren, Novit. Zool. i. p. 404 (1894).

Seven specimens (1 ♂, 6 ♀) from Omei-shan, Wa-shan, Pu-tsu-fong, Che-tou, and Chang-yang, June.

Distribution. Japan (Warren); Central and Western China.

Bapta clarissa.

Iodis clarissa, Butl. III. Typ. Lep. Het. ii. p. 49, pl. xxxvi. fig. 4 (1878).

Pseudopanthera clarissa, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 117.

A nice series from Yokohama in Pryer's collection.

I obtained specimens in Satsuma in May and at Nagasaki in June, and my native collector took the species at Hakodate and in the island of Kiushiu.

Hab. Japan; Yesso; Kiushiu; Amur.

- *Bapta inamata*.

Acidalia inamata, Walk. Cat. Lep. Het. xxii. p. 755 (1861).

Noreia inamata, Moore, Lep. Ceyl. iii. p. 406, pl. 185. fig. 4 (1887).

Acidalia simplicaria, Walk. l. c. xxiii. p. 793 (1861).

Bapta inamata, Hampson, Fauna Brit. Ind., Moths, iii. p. 154 (1895).

I obtained a female specimen in Satsuma which appears to be referable to this species, but the transverse line is rather deeper in colour on all the wings.

Distribution. Sylhet; Nilgiris; Ceylon; Sumatra; Borneo (Hampson); Japan.

Bapta ochrilinea.

Bapta ochrilinea, Warren, Novit. Zool. i. p. 404 (1894).

Hab. China.

I have not seen the type of this species.

Genus *ANGERONA*.

(Dup. Léop. iv. p. 181.)

Angerona prunaria.

Phal. *Geometra prunaria*, Linn. Syst. Nat. x. 520.

Geometra prunaria, Hübn. Geom. figs. 122, 123.

Angerona prunaria, Dup. vii. pl. 147. figs. 1, 2; Guen. Phal. i. p. 116.

Euchlana prunaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 112.

Several specimens from Yokohama, Oiwake, and Yesso in Pryer's collection. I took the species at Gensan in June.

Most of the European forms are represented in Japan, but there is a wider range in the size of the specimens—the smallest example being only 36 millim. in expanse, whilst the largest measures 74 millim.

Distribution. Europe; Amur; Corea; Japan; Yesso.

Angerona nigrisparsa.

Angerona nigrisparsa, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 370 (1879).

A few specimens from Yokohama and Oiwake in Pryer's collection. I captured the species at Sendai in September. Mr. Smith met with it at Hakone and Myianoshita in August.

Hab. Japan.

Genus *METROCAMPA*.

(Latr.; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 111.)

Metrocampa grandinaria.

Angerona grandinaria, Motsch. Etud. Ent. p. 37 (1860).

Ennomos serrata, Brem. Lep. Ost-Sib. p. 100, pl. viii. fig. 11 (1864).

Metrocampa serrata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 112.

There were several specimens in Pryer's collection, and I have received examples from Mr. Manley of Yokohama. The species also occurs at Ohoyama, Nikko, Tokio, Oiwake, and Kintokisan.

Distribution. Amur; Japan.

Metrocampa prattiaria.

Cidaria prattiaria, Leech, Entom., Suppl. p. 51 (May 1891).

Cidaria prattiaria, var. *unicoloraria*, Leech, *l. c.* p. 52.

Several specimens from Oiwake in Pryer's collection.

I received one male specimen and two females from Omeishan; one male from Moupin and one example of each sex from Chang-yang: July.

The Chang-yang specimens are rather redder in colour than the others in the series, and the Moupin male is brownish tinged with purplish. All the Chinese specimens are larger than the Japanese.

Distribution. Japan; Central and Western China.

Genus *CABERODES*.

(Guen.; Hampson, Fauna Brit. Ind., Moths, lii. p. 158 (1895).)

Caberodes simplicior.

Somatina simplicior, Butl. Trans. Ent. Soc. 1881, p. 412.

Cidaria pallidaria, Leech, Entom., Suppl. p. 51 (1891).

There were two specimens, labelled Fujisan and Nikko,

in Pryer's collection, and my native collector took an example in Kiushiu. Butler's type was from Tokio.

Hab. Japan and Kiushiu.

Genus NUMERIA.

(Dup. Léop. iv. p. 107.)

Numeria pulveraria.

Phal. Geometra pulveraria, Linn. x. 521; Clerck, Icon. pl. v. figs. 6, 9.

Metrocampa pulveraria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 112.

Numeria japonica, Butl. Trans. Ent. Soc. Lond. 1881, p. 418.

A fine series in Pryer's collection under the name *N. japonica*.

My native collector obtained specimens at Gensan in July and also in the island of Kiushiu. I received one example from Chang-yang taken in July.

The specimens from Gensan and Kiushiu are very small.

Distribution. Europe; Ural; Altai; Amur; Japan; Kiushiu; Corea.

Genus ENDROPTOIDES.

(Warren, Novit. Zool. i. p. 463 (1894).)

Endropioides abjecta.

Endropia abjecta, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 371 (1879).

Endropia Snelleni, Hedem. Horæ Soc. Ent. Ross. xvi. p. 46, pl. x. fig. 1 (1881).

A fine series from Yokohama, Fujisan, Gifu, and Yesso in Pryer's collection.

Snelleni, Hedem., is certainly a dark form of *E. abjecta*, Butl. The species is variable as regards coloration, and ranges from dark reddish brown through pale reddish brown to a pale whity brown with reddish-brown outer margins. In some of the dark specimens the wings are unicolorous; in others the basal area of primaries is paler.

Meyrick (Trans. Ent. Soc. Lond. 1892, p. 112) places *Snelleni* in *Metrocampa* and considers it synonymous with *indictinaria*, Brem.

Distribution. Japan; Yesso; Askold.

- Genus EPHORIA.

(Meyrick, Trans. Ent. Soc. Lond. 1892, p. 109.)

Ephoria arenaea.

Epione arenaea, Butl. Ill. Typ. Lep. Hst. ii. p. 40, pl. xxxv. fig. 1 (1878).

Ephoria arenaea, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 109.

There was a fine series from Oiwake and one specimen from Yesso in Pryer's collection.

Butler's type was from Hakodate.

Distribution. Amur (*Graesser*); Japan; Yesso.

— *Ephoria leda*.

Epione leda, Butl. Ill. Typ. Lep. Het. ii. p. 46, pl. xxxv. fig. 5 (1878) (♂).

Epione strenioides, Butl. l. c. fig. 6 (♀).

Epione lachrymosa, Butl. Trans. Ent. Soc. 1881, p. 402 (var. ♂).

Epione ossea, Butl. l. c. (var. ♀).

Calcaritis Oberthuerii, Butl. op. cit. p. 507 (var. ♀).

Therapis straminea, Butl. op. cit. p. 401 (var. ♀).

There was a fine series of each sex of this species from Ohoyama and Nikko in Pryer's collection, including examples of the forms *lachrymosa* and *ossea*.

I have received a male which approaches the *strenioides* form from Chang-yang and a female of the same form from Chia-ting-fu, both taken in July.

Distribution. Japan; Central and Western China.

Ossea and *Oberthuerii* appear to be forms of the female, and *lachrymosa* a form of the male, while *straminea* is a modification of the *ossea* form in which all the transverse lines are absent.

Genus SCARDAMIA.

(Guen. Phal. i. p. 80 (1857).)

— *Scardamia metallaria*.

Scardamia metallaria, Guen. Phal. i. p. 89 (1857).

Laginia bractearia, Walk. Cat. Lep. Het. xx. p. 245 (1860).

Scardamia aurantiacaria, Brem. Lep. Ost-Sib. p. 72, pl. vi. fig. 15 (1864).

Scardamia taprobanes, Feld. Reise Nov. pl. cxxiii. fig. 2 (1875).

Appears to be plentiful in the island of Kiushiu. I met with it at Nagasaki and in the province of Satsuma, and have received it from Gensan in Corea.

In Western China it occurs at Moupin and in the province of Kwei-chow; and in Central China at Ichang and Chang-yang.

Distribution. Central and Western China; Japan; Corea; Eastern Siberia; India; Ceylon; Java.

Scardamia obliquaria, sp. n.

Similar to *S. metallaria*, Guen., but the first transverse line of primaries is elbowed above the middle, and the second

line is oblique from near apex; the marginal area is deeper orange than other portions of the wings.

Expanse 28 millim.

One female specimen taken by myself at Gensan in July.

Hab. Corea.

Genus PERATOPHYGA.

(Warren, Novit. Zool. i. p. 407 (1894).)

— *Peratophyga erata*.

Acidalia erata, Moore, Proc. Zool. Soc. Lond. 1867, p. 648.

Ephyra grata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 438 (1879).

Peratophyga erata, Hampson, Fauna Brit. Ind., Moths, iii. p. 164 (1895).

There were specimens in Pryer's collection from Yokohama, and I met with the species at Nagasaki. It occurs also at Chang-yang, Kiukiang, Moupin, Pu-tsu-fong, Ta-chien-lu, and Omei-shan.

Distribution. Eastern, Central, and Western China; Japan; Himalayas.

This species seems to vary considerably in size and in the intensity of the markings.

Genus STEGANIA.

(Guen.; Hampson, Fauna Brit. Ind., Moths, iii. p. 164 (1895).)

— *Stegania irroraria*, sp. n.

Pale ochreous, irrorated with ferruginous. Primaries have the costa purplish brown, and there is a narrow curved and recurved band of the same colour from one fourth before apex to inner angle; from the lower curve of this band there is a broad purplish-brown bar extending to the marginal line, which is of the same colour. Secondaries have a narrow purplish-brown band on outer margin. All the wings have a blackish discal dot and a diffuse ferruginous-brown central band, the latter is often interrupted and sometimes entirely absent. Fringes of the ground-colour. Under surface rather paler than above, with similar markings but darker in colour.

Expanse 21 millim.

I obtained a nice series at Nagasaki in May, and I have received specimens from Ningpo and Gensan.

Distribution. Kiushiu; Corea; and N.E. China.

Allied to *S. bilineata*, Butl.

Genus SYNEGIA.

(Guen. Phal. i. p. 423 (1857).)

— *Synegia pardaria*.

Anisodes pardaria, Guen. Phal. i. p. 420 (1857).

Synegia pardaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 170 (1895).

Occurs at Chang-yang, Moupin, and Omei-shan.

Distribution. Khâsis; Ceylon; Borneo (*Hampson*); Central and Western China.

Synegia hadassa.

Anisodes hadassa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 400 (1878);

Ill. Typ. Lep. Het. iii. p. 38, pl. L. fig. 5 (1879).

Synegia inconspicua, Butl. Trans. Ent. Soc. 1881, p. 412.

Syntaracta hadassa, Warren, Novit. Zool. i. p. 408 (1894).

Both forms of this species occur commonly in the island of Kiushiu. There was one example of the *inconspicua* form in Pryer's collection, and I received one specimen of the same form from Yokohama, several from Hakone, and one from Chang-yang.

In the series from Kiushiu there are forms connecting the type and *inconspicua*, and others which are broadly suffused with leaden grey.

Distribution. Japan; Kiushiu; Central China.

— *Synegia omissa.*

Syntaracta omissa, Warren, Novit. Zool. i. p. 409 (1894).

One example from Chow-pin-sa, Western China. I have also received it from the Loochoo Islands and from Kiushiu; and there was a specimen in Pryer's collection.

Distribution. Loochoo Islands; Japan; Western China.

— *Synegia esther.*

Synegia esther, Butl. Trans. Ent. Soc. Lond. 1881, p. 411.

There were several specimens in Pryer's collection. I have also received examples from Chang-yang, Omei-shan, and the island of Kiushiu.

The Chinese specimens are lighter in colour and the transverse lines are narrower and not diffused.

Distribution. Japan; Kiushiu; Central and Western China.

— *Synegia rosearia*, sp. n.

Male.—Primaries yellowish; basal half freckled with rosy and traversed by a violet-grey band, which is elbowed below costa; the outer half has a broad violet-grey band, from the inner edge of this there is a suffusion of the same colour towards the base of the wing and a diffuse projection towards the middle of outer margin; a violet-grey streak from apex almost touches the band, and there are some marks of the same colour towards inner angle. Secondaries yellowish; basal patch violet-grey; beyond, the wing is traversed by

more or less confluent rosy waved lines, and the outer margin has a diffuse violet-tinged rosy band. Under surface pale whitish brown, with the markings of upperside reproduced in dusky violet-grey.

Female.—The discal area of primaries is more suffused with violet-grey.

Expanse, ♂ 31, ♀ 34 millim.

One male specimen from Ichang, a male from Omei-shan, and a female from Moupin: June and July.

Hab. Central and Western China.

Genus SELENIA.

(Hübner. Verz. Schmett. p. 292 (1816).)

Selenia tetralunaria.

Geometra tetralunaria, Hufn. Berl. Mag. iv. p. 506 (1769).

Selenia illustraria, Hübner. Verz. Schmett. p. 293; Guen. Phal. i. p. 154.

Selenia tetralunaria, var. *æstiva*, Stand. Cat. p. 157, = var. A, Guen. l. c. p. 155.

My native collector took a female specimen of the typical form at Hakodate in June, and I captured four examples of var. *æstiva* at that place in August.

Distribution. Europe; Yesso.

Selenia pallidaria.

Selenia pallidaria, Leech, Entom., Suppl. p. 43 (May 1891).

There was one female specimen from Yesso in Pryer's collection.

Hab. Yesso.

Selenia adustaria. (Pl. VII. fig. 7.)

Selenia adustaria, Leech, Entom., Suppl. p. 42 (May 1891).

Selenia adustaria, var. *fusca*, Leech, l. c.

Three specimens from Yesso in Pryer's collection. One of these is probably an individual of the second brood.

Hab. Yesso.

Selenia sordidaria, sp. n.

Very pale whitish brown, irrorated and marked with brownish on costa of primaries; all the wings have two thin brownish transverse lines. Under surface as above, but there is an ochreous lunular patch freckled with brownish on apex of primaries, and the area of secondaries between the outer line and the base of the wing is tinged with ochreous and

speckled with brownish; discal spots black, that on primaries linear.

Expanse 48 millim.

One male specimen from Ichang, April.

Hab. Central China.

Selenia (?) *crenularia*, sp. n.

Pale primrose-yellow. Basal area of primaries pinkish on the costa and limited by a dingy olive band with irregular edges, commencing as a brown spot on costa; there are some marks of the same colour within the band; beyond there is an interrupted macular, dingy olive band, the costal spot brown; the outer marginal area is limited by a pink line and suffused on the lower portion with the same colour. Secondaries have a dark discal spot, and the outer marginal area agrees with that of the primaries. The outer margins of all the wings are highly crenulate, and the fringes are olive. Under surface similar to the upperside, but the yellow is brighter and the secondaries are sprinkled with pinkish on costa, and the abdominal area is whitish. Antennæ with short ciliæ.

Expanse 50 millim.

One male specimen from Ta-chien-lu, May.

Hab. Western China.

Selenia (?) *bilinearia*, sp. n.

Whity brown, with a faint tinge of pink. Primaries have two oblique dark transverse lines—the first is angulated on costa, edged inwardly with whitish, and limits the brownish basal area; the second line traverses an irregular brownish band and is outwardly edged with whitish; the outer margin is clouded with brownish below apex and above inner angle, and there are some smaller marks of the same colour between the clouds. Secondaries have a dark transverse line agreeing with the outer one of primaries, and the ground-colour is obscured with brownish, except on costal and submarginal areas. Fringes of the ground-colour suffused and chequered with darker. Under surface: primaries bright yellow, paler on costa and inner margin; there are two transverse lines as above; secondaries paler, with two dark transverse lines approximating on inner margin.

Expanse 36 millim.

One male specimen from Chang-yang, June.

Hab. Central China.

Genus PERICALLIA.

(Steph.; Hampson, Fauna Brit. Ind., Moths, iii. p. 223 (1895).)

- *Pericallia distans*.

Hygrochroa distans, Warren, Novit. Zool. ii. p. 149 (1895).

There was a specimen from Yesso in Pryer's collection. Mr. Smith took a male specimen at Hakone in August, and my native collector obtained one in the island of Kiushiu. I received one female from Omei-shan, taken in July.

In the Chinese example the transverse line is blacker and more conspicuous than in the Japanese specimens. The Kiushiu specimen is only 32 millim. in expanse.

Distribution. Japan; Yesso; Kiushiu; Western China.

P. distans is very close to *P. syringaria* from Europe, and is possibly only an Asiatic form of that species. It may be referable to *P. parva*, Hedem.*, from Amurland.

Pericallia marmorataria, sp. n. (Pl. VI. fig. 15.)

Greyish-white, with a faint pinkish tinge. Basal patch of primaries reddish-grey, clouded with darker and limited by a whitish grey-edged curved line; central line deep brown, acutely angled below costa, slightly curved to first median fork, where it passes through a violet-brown cloud, then oblique to inner margin; between the central line and the whitish apex of the wing there is a grey-brown patch on costa intersected by a whitish stripe, and from the lower end of this last a thin brown curved line runs to a grey-brown cloud on inner margin. Secondaries are traversed by two brown lines, the outer one very fine and dotted with blackish on the nervules; beyond, the outer marginal area is clouded and suffused with greyish brown and traversed by a wavy line of the ground-colour. Fringes brown. Under surface: colour as above; primaries have a brownish basal patch and a diffuse central line, the last is slightly angulated below costa and followed by a brownish patch, which is intersected by a whitish streak that unites with a whitish submarginal line, the lower end of the submarginal line is bordered by a brownish cloud, and there is another cloud of the same colour on the middle of outer margin; secondaries clouded with brownish at the base, discoidal spot blackish, other markings correspond with those of upper side, but the abdominal portion of central line is reddish brown.

Expanse 40 millim.

* Horn Soc. Ent. Ross. xvi. p. 45 (1881).

One male specimen from Chang-yang, July.

Hab. Central China.

This species is very similar to *P. syringaria*, Linn., in colour and approaches the Japanese *P. distans*, Warren.

— *Pericallia productaria*, sp. n.

Light brown, striated and clouded with darker. Primaries have a brownish subbasal line elbowed below costa and a central brown fascia, the outer edge of the latter is blackish and has an obtuse projection extending to the indistinct pale submarginal line; costa and outer margin with paler patches tinged with lilacine. Secondaries have a central fascia which appears to be a continuation of that on primaries, but the projection on outer edge is less pronounced and there are two indentations below it. All the wings have a black discal spot, that on primaries rather linear. Fringes crenulate, brown marked with paler, and preceded by a brown line. Under surface ochreous, striated with reddish brown; all the wings have a blackish discal spot and a purplish-brown central line, the latter, on secondaries, is bordered with purplish towards abdominal margin; there is a dusky transverse shade on primaries from costa to median nervure. Vertex of head whitish.

Expanse 36 millim.

One male specimen from Wa-shan, May.

Hab. Western China.

Allied to *P. albifrons*, Moore.

— *Pericallia olivaria*, sp. n.

Pale brown, striated and suffused with olivaceous; beyond the black discal spot there is an olive band crossing all the wings, the inner edge of this band is diffuse and the exterior elbowed below costa of primaries and obtusely angled on secondaries; there are indications of a pale wavy submarginal line on each wing intersecting an olivaceous cloud towards the inner and anal angles respectively; the apex of primaries and outer angle of secondaries are also clouded with olivaceous; secondaries have a blackish discal spot and there is a dark olive spot in the middle of submarginal line and a curved one at the costal end of the same line. Under surface yellow, powdered with reddish on inner area of primaries; outer marginal area of all the wings brownish, clouded with yellow towards apex and outer angle, and with greyish white towards inner and anal angles, the limiting line is dark brown edged outwardly with whitish.

Expanse 40-42 millim.

Four male specimens from Moupin, July.

Hab. Western China.

Pericallia crenularia, sp. n.

Brown tinged with lilacine. Primaries have a subbasal dusky line, curved towards costa and again towards inner margin; a concolorous central fascia outlined in brownish, the inner edge almost straight and the outer edge obtusely angled below costa and then inwardly oblique; submarginal line interrupted, most distinct towards costa. Secondaries have a dusky, waved, central line, edged inwardly with brownish and preceded by an obscure brownish shade and discal spot; submarginal line indistinct. Under surface yellow; outer marginal area limited by a strong blackish line. Fringes brown, crenulate. Vertex of head pure white.

Expanse 40 millim.

One male specimen from Omei-shan, July.

Hab. Western China.

Pericallia latimarginaria, sp. n.

Pale brown. Primaries: basal area suffused with darker and limited by a curved, wavy, blackish line; outer line blackish, parallel with outer margin as far as third median nervule, then turned inwards and curved from second to first median nervule, from which point it runs almost straight to inner margin, this line traverses a brownish shade which tapers from inner margin to costa; there is a brownish cloud on the outer margin below apex, and the space between this and the transverse shade is tinged with pinkish. Secondaries have the outer half brownish, tinged with pinkish towards margin, and traversed by a bidentate blackish line. All the wings have a black discal spot and an ill-defined, shaded, pale submarginal line. Under surface yellow; outer marginal area clouded with greyish brown, limited by a dark line and marked with whitish at angle of each wing; discal spots and transverse lines as above. Vertex of head white.

Expanse 36-40 millim.

Several specimens of each sex from Chang-yang and from Moupin, June and July.

Hab. Central and Western China.

Pericallia variaria, sp. n.

Pale greyish-brown, tinged with pinkish, freckled with fuscous and clouded with the latter colour, especially on the

basal area of secondaries and between the transverse lines of primaries. There are two transverse lines on primaries: the first is blackish, elbowed below costa, and slightly indented above inner margin; the second is rather oblique, double, except at each extremity, enclosing a paler area; beyond the second line there is a blackish quadrate blotch, the centre of which is filled in with pinkish; discal spot black. Secondaries have a black discal spot and an olivaceous crenulate band; submarginal band serrated, blackish, but not well-defined towards costa. Fringes fuscous, tinged with olivaceous. Under surface violet-grey, clouded and suffused with fuscous; primaries have a dusky band, elbowed below costa, before the middle, and a ferruginous-brown band bordered with darker beyond the middle; the space between these bands is marked with creamy white; submarginal line whitish; a broad and diffuse ferruginous patch extends from black discal spot to submarginal line, which it obscures at this point; secondaries have the basal area marked with creamy white: the transverse band appears to be a continuation of the outer one on primaries; submarginal band as above but dusky in colour. Outer margin of the wings, especially of secondaries, crenulate.

Expanse 36 millim.

One male specimen from Chia-ting-fu, July.

Hab. Western China.

Pericallia testacea.

Pericallia testacea, Butl. Trans. Ent. Soc. 1881, p. 405.

There were several specimens from Yesso in Pryer's collection. Fenton took the species at Tokio.

Hab. Japan and Yesso.

Genus *XYLOSCIA*.

(Warren, Novit. Zool. i. p. 402 (1894).)

Xyloscia subpersata.

Hemerophila subpersata, Feld. Reise Nov., Lep. v. pl. cxxv. fig. 16 (1875).

Xyloscia subpersata, Warren, Novit. Zool. i. p. 402 (1894).

Several specimens from Oiwake and Yokohama in Pryer's collection. I captured a female example at Gensan in July.

Hab. Japan and Corea.

Xyloscia biangularis, sp. n. (Pl. VI. fig. 5.)

Pale brown, sparingly irrorated with blackish; the basal

area of primaries and outer marginal area of all the wings suffused with violaceous brown. On the primaries the blackish line limiting the basal area is biangulate below costa and very oblique from median nervure to inner margin; outer line oblique, blackish, appearing to commence below apex in the undulated and diffuse blackish submarginal line and preceded by a slightly wavy brown line, which limits the outer marginal area. Secondaries have a brown central line followed by a blackish one parallel with it; submarginal line diffuse, blackish; all the wings have a black discal dot, but that on secondaries most conspicuous. Under surface similar to above, but the basal two-thirds of secondaries paler.

Expanse 37 millim.

One male specimen from Chang-yang, June.

Hab. Central China.

Closely allied to *X. subpersata*, Feld., but the transverse markings rather different, the outer line on primaries terminates on outer margin below the apex; outer margin of secondaries is slightly crenulate, with a distinct projection above the middle.

- Genus *APERICALLIA*, nov.

Palpi porrect, densely hairy, extending considerably beyond the frons. Antennæ of male bipectinated to apex. Posterior tibiæ not dilated, with all spurs present. Primaries have the outer margin slightly concave below apex, angled at fourth vein, thence oblique. Secondaries have the outer margin slightly angled at middle. Venation similar to that of *Pericallia*.

Type *A. bilinearia*, sp. n.

Apericallia bilinearia, sp. n.

Primaries whitish grey, tinged with lilacino and freckled and clouded with fuscous; the central area is traversed by two dusky-brown, almost blackish, lines: the inner one very slightly curved and the outer one oblique and followed by two blackish spots. Secondaries pale whitish brown, powdered with fuscous, and traversed by a dark brown line, which tapers towards but does not attain the costa. Fringes brown on primaries, grey on secondaries, merging into brown at anal angle. Under surface ochreous brown, freckled with blackish; transverse lines and markings generally as above, but the outer line of primaries is followed by a ferruginous patch on costa; the secondaries are whiter and have

a diffuse ferruginous central band which obscures the transverse line.

Expanse 36-40 millim.

Four male specimens and three females from Pu-tsu-fong and Moupin, June and July.

Hab. Western China.

— Genus *HETEROCALLIA*, nov.

Palpi extending beyond the frons, clothed with long hair; antennæ of male setaceous; hind tibiæ dilated, all spurs present. Primaries with apex slightly produced, outer margin obtusely angled at middle. Secondaries with outer margin rounded, slightly emarginate above middle. Venation similar to that of *Pericallia*.

Type *H. truncaria*, sp. n.

— *Heterocallia truncaria*, sp. n. (Pl. VI. fig. 1.)

Whitish-grey, tinged with violaceous, irrorated and clouded with fuscous. Primaries have three transverse dark-brown or blackish lines, the first not always clearly defined, all are curved below costa, and the third is recurved and dentate before inner margin; following the third line is a fuscous-brown band marked with darker brown below the upper curve, which is also deeper brown; submarginal line oblique, white towards costa, where it is interrupted and adjoins the fuscous-brown band. Secondaries have three fuscous bands, but these are only well-defined on the abdominal area. Fringes greyish, preceded by a series of black dots. Under surface pale greyish, irrorated with fuscous and suffused on the disk with ochreous; apical area of primaries clouded with brownish, submarginal line represented by three white dots: secondaries have two diffuse transverse bands, these are brown inclining to blackish on abdominal area, the outer one with a small elongate blackish spot about the middle.

Expanse 42 millim.

Occurs at Moupin, Ta-chien-lu, Pu-tsu-fong, and Che-tou in July. I received twelve specimens, including both sexes.

Hab. Western China.

Genus *PSYRA*.

(Walk.; Hampson, *Fauna Brit. Ind.*, *Moths*, iii. p. 221 (1895).)

— *Psyra rufolinearia*, sp. n.

Whitish brown, with a faint ochreous tinge on the disk and irrorated with fuscous. Primaries have a sinuous red-

dish line, dotted with black on the nervures, before the middle; this does not extend to the costa, where it is represented by a black dot and an oblique reddish line, followed by a series of black dots on the nervules beyond the middle; there is also a short, interrupted blackish band from just before apex, and a similar one towards inner margin; the oblique line together with series of black dots are continued on the secondaries, and all the wings have a blackish discal dot and a marginal series of black dots. Fringes of the ground-colour. Under surface whitish-brown, irrorated with fuscous; outer marginal area with fuscous border, most clearly defined on the primaries; the secondaries have a dusky central line and two series of blackish dots, the outer series connected by a dusky lunulated line; marginal and discal dots as above.

Expanse 60 millim.

One female specimen from Moupin, July.

Hab. Western China.

— *Payra cuneata*.

Payra cuneata, Walk. Cat. Lep. Het. xxi. p. 483 (1860); Hampson, Fauna Brit. Ind., Moths, iii. p. 223 (1895).

One male specimen from Wa-shan, two females from Putsu-fong, and a male from Japan in Pryer's collection.

Distribution. N.W. Himalayas; Sikhim; Khâsis (Hampson); Japan; Western China.

Genus FASCELLINA.

(Walk. Cat. Lep. Het. xx. p. 215 (1860).)

— *Fascellina plagiata*.

Geometra plagiata, Walk. Cat. Lep. Het. xxv. p. 1601 (1866).

Fascellina plagiata, Hampson, Fauna Brit. Ind., Moths, iii. p. 226 (1895).

I have specimens from Ichang, Chia-ting-fu, Ta-chien-lu, and Omei-shan.

Distribution. Khâsis (Hampson); Kulu, N.W. Himalayas; Central and Western China.

Genus LEPTOMIZA.

(Warr., Hampson, Fauna Brit. Ind., Moths, iii. p. 223 (1895).)

— *Leptomisa calcearia*.

Hyperythra calcearia, Walk. Cat. Lep. Het. xx. p. 182 (1860).

Leptomisa calcearia, Hampson, Fauna Brit. Ind., Moths, iii. p. 231 (1895).

One specimen from Moupin, July.

Distribution. N.W. Himalayas; Sikhim (Hampson); Western China.

— *Leptomiza dentilineata*.

Selenia dentilineata, Moore, Lep. Atk. p. 228 (1887).

Leptomiza dentilineata, Hampson, Fauna Brit. Ind., Moths, iii. p. 231 (1895).

Heterolocha mediolimbata, Pouj. Ann. Soc. Ent. Fr. 1895, p. 308, pl. vi. figs. 3, 3 a.

One specimen received from Chang-yang, August; Poujade records an example from Moupin.

Distribution. Sikhim (Hampson); Central and Western China.

— *Leptomiza* (?) *lentiginosaria*.

Collix lentiginosaria, Leech, Entom., Suppl. p. 55 (May 1891).

There were some specimens from Yokohama? and Gifu in Pryer's collection. I obtained examples of each sex at Hakodate in August, and received a female specimen from Chia-ting-fu, taken in July.

Distribution. Japan; Yesso; Western China.

Genus *GARÆUS*.

(Moore, Proc. Zool. Soc. Lond. 1867, p. 623.)

Garæus specularis.

Garæus specularis, Moore, Proc. Zool. Soc. Lond. 1867, p. 623, pl. xxxii. fig. 3; Hampson, Fauna Brit. Ind., Moths, iii. p. 233, fig. (1895).

Endropia mactans, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 303 (1878); Ill. Typ. Lep. Het. iii. p. 30, pl. xlviii. fig. 3 (1879).

Garæus fenestratus, Butl. Trans. Ent. Soc. Lond. 1881, p. 404.

There were several specimens from Ohoyama and Nikko in Pryer's collection, and I received two examples from Chang-yang and one from Ichang.

Distribution. Sikhim; Japan; Central China.

This species is exceedingly variable both in colour and markings; in some specimens the hyaline spots are entirely absent. The range of colour is from pale yellowish brown to dark purplish brown. One of the Chang-yang specimens agrees with Hampson's figure of *G. specularis*, Moore.

— *Garæus argillaceus*.

Pseudomiza argillacea, Butl. Ill. Typ. Lep. Het. vii. p. 100, pl. cxxxv. fig. 15 (1889).

Garæus argillaceus, Hampson, Fauna Brit. Ind., Moths, iii. p. 235 (1895).

One male specimen from Chia-ting-fu, Western China, July.

Distribution. Dalhousie; Dharmasala; Sikhim; Shillong (Hampson); Western China.

Genus NOTHOMIZA.

(Warren, Novit. Zool. i. p. 443 (1894).)

Nothomiza formosa.

Ellopiia formosa, Butl. Ill. Typ. Lep. Het. ii. p. 47, pl. xxxv. fig. 8 (1878).

Several specimens from Yokohama and Gifu in Pryer's collection.

I captured specimens in Satsuma in May and at Tsuruga and Nagahama in July. Mr. Smith took the species at Hakone in August.

Hab. Japan; Kiushiu.

Genus HETEROMIZA.

(Warren, Proc. Zool. Soc. Lond. 1893, p. 405.)

— *Heteromiza sanguiflua*.

Cimicodes sanguiflua, Moore, Lep. Atk. p. 233, pl. viii. fig. 4 (1887).

Heteromiza flava, Hampson, Fauna Brit. Ind., Moths, iii. p. 230 (1895).

I have received specimens from Omei-shan, Moupin, and Chang-yang, June and July.

Hampson considers that *H. flava* is a form of *H. sanguiflua*, but I am inclined to regard them as distinct species.

Distribution. Khásis; Central and Western China.

— *Heteromiza flava*.

Cimicodes flava, Moore, Lep. Atk. p. 233, pl. viii. fig. 5 (1887).

One male example from Moupin, July.

Distribution. Khásis (*Hampson*); Western China.

— *Heteromiza cruentaria*.

Cimicodes cruentaria, Moore, Proc. Zool. Soc. Lond. 1867, p. 616; Waterh. Aid, pl. cli. fig. 6.

Heteromiza cruentaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 237 (1895).

One example of each sex from Chang-yang, July.

Distribution. Western Himalayas; Khásis (*Hampson*); Central China.

Genus DALIMA.

(Moore, Proc. Zool. Soc. Lond. 1867, p. 614.)

— *Dalima variaria*, sp. n.

Male. — Ochreous-brown, striated with purplish-brown. Primaries have a brownish diffuse band, which is angled below costa and traversed throughout its course by a wavy

silvery-white line, and terminates in a black quadrate spot on middle of the inner margin; submarginal band shade-like and obscure: secondaries have two purplish-brown bands, and between these there is an interrupted silvery-white line bordered with fuscous. All the wings have a dusky discal spot; fringes brown. Under surface orange, sparingly freckled with blackish; primaries have a black discal spot and a blackish wavy submarginal band, the latter interrupted towards costa, where it is represented by a round spot; secondaries have a black discal spot, preceded by a blackish abbreviated band from abdominal margin, and a blackish wavy submarginal band. Antennæ as in *D. aoutaria*.

Female.—Cinnamon-brown; the markings as in the male, but less distinct.

Expanse, ♂ 52, ♀ 53 millim.

Four male specimens and one female from Moupin, Omei-shan, and Ta-chien-lu, June and July.

—*Var. grisearia*, nov.

Purplish grey, deeper on the secondaries and outer marginal area of primaries; there are no purplish-brown striations; the transverse markings and discal spots are similar to those of the type, but the outer line of primaries is olive-brown.

Two male specimens from Omei-shan, July.

—*Var. albomaculata*, nov.

Primaries ochreous brown, suffused with olive-brown, conspicuously so beyond the transverse line: secondaries purplish brown. Markings as in the type, but in addition there is a series of silvery-white lunules on the outer margin of primaries and a cloud of the same colour, interrupted by the nervules, in the angle of transverse line.

One male specimen from Pu-tau-fong, July.

Hab. Western China.

—*Dulima obliquaria*, sp. n.

Apex of primaries acute; secondaries have an angular projection above middle of outer margin. Pale reddish brown; first line of primaries rufous, undulated; second line indicated by a short rufous streak from costa and another on inner margin; third line rufous, running obliquely from apex to middle of the inner margin, where it terminates very close to the second line, a short outwardly oblique streak from the costa approaches the upper portion of this line; there are traces of a diffuse, dusky, submarginal band. Fringes darker.

Secondaries have two rufous lines and a diffuse submarginal band as on primaries. Under surface orange, speckled with fuscous grey; outer margins suffused with fuscous.

Expanse 52 millim.

One female specimen from Wa-ssu-kow, June.

Hab. Western China.

— *Dalima ochrearia*, sp. n.

The apex of primaries is acutely produced and the secondaries have an angular projection above the middle of outer margin. Pale ochreous brown, tinged with pink, especially on the outer marginal areas of all the wings. Primaries have three brown spots on costa; beyond the middle there is a transverse yellowish line, sharply angled in the direction of the apex of the wing, and then oblique to inner margin, where it terminates slightly in advance of a dark quadrate spot placed on the middle of the margin; this line is outwardly bordered with olivaceous. Secondaries have a transverse yellowish line outwardly bordered with olivaceous and an indistinct dusky line nearer the base of the wing. In some specimens there are indications of a submarginal line on each wing. Under surface orange, freckled with fuscous.

Expanse 50–52 millim.

Several examples of both sexes from Moupin; Chia-ting-fu; Wa-shan; Pu-tsu-fong; Chang-yang: June and July.

The Chang-yang examples are tinged with olivaceous and have indistinct traces of basal and median transverse lines.

Hab. Central and Western China.

— *Dalima acutaria*, sp. n.

The primaries are produced at apex and there is a slight projection on the outer margin of the secondaries below outer angle. Brownish grey, more or less tinged with rufous. Primaries have three short rufous-brown dashes on costa, from the first of which there are indications of a silvery-grey-edged transverse line to the inner margin, and from the third there is a line projected in the direction of outer margin, which, however, it does not reach, but turns sharply inwards and runs obliquely to middle of the inner margin; beyond this line, which is edged with yellowish, the wing is tinged with fuliginous. Secondaries have two central rufous-brown lines, the inner straight and the outer curved, the latter edged inwardly with yellowish. Fringes rufous-brown. Under surface orange, freckled with blackish; marginal area of all the wings suffused with dusky and limited inwards by a

blackish diffuse band. All the wings have a black discal spot on both surfaces. Antennæ of male serrate and fasciculate.

Expanse 56-64 millim.

Two male specimens from Pu-tsu-fong and one from Omei-shan, July.

The type described is rather browner in colour than the other specimens; this is probably due to its finer condition.

Hab. Western China.

— *Dalima columbinaria*, sp. n.

Grey, with a tinge of lilacine. Primaries have two short transverse dashes on the costa and a transverse line beyond the middle, which is sharply angled below the apex of the wing, and then runs obliquely to the middle of the inner margin, where it is inwardly edged with silvery grey; discal spot blackish: secondaries have two slightly curved blackish or dark brown lines, the outer edged internally with silvery grey. All the wings have an interrupted dusky submarginal band-like shade. Fringes brown. Under surface orange, freckled with blackish; transverse markings of upper surface indicated in blackish.

Expanse 54-56 millim.

One male specimen from Omei-shan and one from Moupin, June and July.

Allied to *D. vulpinaria*, Moore.

Hab. Western China.

— *Dalima subferrugineata*.

Drepanodes subferrugineata, Pouj. Ann. Soc. Ent. Fr. 1895, p. 307, pl. vi. figs. 2, 2 a.

Poujade records a female specimen taken by M. l'Abbé A. David at Moupin.

Hab. Western China.

Genus **AMBLYCHIA.**

(Guen. Phal. i. p. 214 (1857).)

— *Amblychia angeronaria*.

Amblychia angeronaria, Guen. Phal. i. p. 215, pl. iv. fig. 9 (1857); Hampson, Fauna Brit. Ind., Moths, iii. p. 242 (1895).

One female specimen from Wa-shan, May.

Distribution. Sikhim; Assam; Ceylon (*Hampson*); Western China.

Genus CEPPHIS.

113

(Hübner; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 118.)

Cepphis advenaria.

Geometra advenaria, Hübner, Beitr. ii. pl. iii. fig. Q; Geom. fig. 45; Esp. pl. xvi. figs. 1-3.

Cepphis advenaria, Hübner, Verz. Schmett. p. 204; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 114.

Epione advenaria, Dup. Lép. vii. pl. cl. fig. 8; Guen. Phal. i. p. 97.

I captured specimens at Gensan in July and at Hakodate in August.

Distribution. Europe; Amur; Japan; Yesso; Corea.

- *Cepphis (?) laterinata*.

Numeria laterinata, Pouj. Ann. Soc. Ent. Fr. 1895, p. 312, pl. vi. fig. 13 (= *N. lateritiaria*, Pouj. Bull. Muséum, février 1895).

Poujade records a male specimen from Monpin. I have two males from that locality taken in July, and one from Huang-mu-chang taken in August.

Hab. Western China.

Genus HYPERYTHRA.

(Guen.; Hampson, Fauna Brit. Ind., Moths, iii. p. 218 (1895).)

- *Hyperythra khasiana*.

Calopyrrha khasiana, Swinh. Ann. & Mag. Nat. Hist. (6) xii. p. 221 (1893).

Hyperythra phanix, Swinh., Hampson, Fauna Brit. Ind., Moths, p. 219 (1895).

Two males from Omei-shan and a female from the province of Kwei-chow, July.

The female has a slight olivaceous tint, but the males are pinkish and yellow.

Distribution. Sikkim; Khasis; Nagas (Hampson); Western China.

Genus ANTHYPERYTHRA.

(Warren, MS.; Swinhoe, Trans. Ent. Soc. Lond. 1891, p. 485.)

- *Anthyperythra hermearia*.

Anthyperythra hermearia, Swinh. Trans. Ent. Soc. Lond. 1891, p. 485, pl. xix. fig. 9.

One male specimen from Omei-shan, July.

Distribution. Khasis; Western China.

Genus CORYPHA.

(Walk. Cat. Lep. Het. xx. p. 270 (1860).)

Corypha incongruaria.*Corypha incongruaria*, Walk. Cat. Lep. Het. xx. p. 270 (1860); Bull. Ill. Typ. Lep. Het. p. 31, pl. xlviii. fig. 6 (1879).

I obtained specimens in Satsuma in May and at Tsuruga in July, and my native collector took the species in the island of Kiushiu and at Ningpo.

Distribution. Japan; Kiushiu; N. China.

Genus AUAXA.

(Walker, Cat. Lep. Het. xx. p. 271 (1860).)

Auaxa sulphurea.*Bizia sulphurea*, Butl. Ill. Typ. Lep. Het. ii. p. 47, pl. xxxv. fig. 10 (1878).

Several specimens from Yokohama and Oiwake in Pryer's collection. I took this species in Satsuma in May, at Tsuruga in June, and at Nagasaki and Gensan in July. I have also received specimens from Chang-yang, Omei-shan, and Moupin, June and July.

The basal line and discal spot of primaries are variable characters in this species; in some of my specimens both are absent.

Distribution. Japan; Korea; Central and Western China.

Probably identical with *Auaxa cesadaria*, Walk., from China, the type of which I have not been able to discover.

Genus BIZIA.

(Walk. Cat. Lep. Het. xx. p. 261 (1860).)

Bizia axaria.

Bizia axaria, Walk. Cat. Lep. Het. xx. p. 261 (1860); Butl. Ill. Typ. Lep. Het. iii. p. 31, pl. xlviii. fig. 5 (1879).
Endropia mibuaria, Feld. Reise Nov. v. pl. cxxiii. fig. 31 (1875).

Several specimens from Yokohama in Pryer's collection. I obtained the species at Tsuruga and Gensan in July, and Mr. Smith took it at Hakone in August. I have also received specimens from Ichang, Chang-yang, Kiukiang, Omei-shan, Chia-ting-fu, and the province of Kwei-chow, June and July.

Fairly constant in colour and markings, but varies in size.

My smallest male specimen expands 44 millim. and largest female 72 millim.; the latter is from Chang-yang.

Distribution. Japan; Yesso; Corea; Western and Central China.

Genus COLOTOIS.

(Hüb. Verz. Schmett. p. 288.)

Colotois pennaria.

Phal. Geometra pennaria, Linn. Faun. Suec. 324.

Geometra pennaria, Esp. pl. xviii. figs. 4-6; Hüb. Geom. fig. 14.

Colotois pennaria, Hüb. Verz. Schmett. p. 288; Meyrick, Trans. Ent. Soc. 1892, p. 114.

Himera pennaria, Dup. Lép. vii. pl. cxlvi. figs. 1, 2; Guen. Phal. i. p. 182.

There was one male specimen in Pryer's collection.

Distribution. Europe; Amur; Japan.

Genus ENNOMOS.

(Treit.; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 114.)

Ennomos autumnaria.

Geometra autumnaria, Wernb. Stett. ent. Zeit. 1859, p. 361.

Geometra alniaria, Esp. Schmett. v. pl. ix. figs. 1-3; Hüb. Geom. fig. 26.

Eugonia alniaria, Hüb. Verz. Schmett. p. 291.

Ennomos alniaria, Treit. Schmett. vi. i. 79; Guen. Phal. i. p. 175.

Ennomos autumnaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 115.

A few examples from Oiwake and Yesso in Pryer's collection.

Distribution. Europe; Ural; Amur; Japan, Yesso.

Genus CROCALLIS.

(Treit.; Hampson, Fauna Brit. Ind., Moths, iii. p. 231 (1895).)

Crocallis acutaria, sp. n.

Primaries pale yellowish brown, sprinkled and suffused with darker; a dark brown line inwardly edged with whitish commences on costa near apex and terminates on inner margin one third from outer angle; a black spot on outer margin in each nervular interspace: secondaries pale brown, slightly suffused with darker within the brownish central line, which becomes indistinct towards costa. All the wings have a dark discal spot, annular on primaries. Fringes brown, paler on

secondaries. Under surface whity brown, with dark markings of upperside faintly reproduced.

Expanse 48 millim.

One example of each sex from Chang-yang, July.

This species is very like the paler forms of *C. arida*, which also occurs in China, but the apex of primaries is acutely produced, especially in the female, and the outer margin is not scalloped between apex and the angular projection. The transverse line, too, is oblique, not curved in the least, and starts from a point on costa much nearer to the apex.

Hab. Central China.

— *Crocallis arida*.

Nipponissa arida, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 394 (1878)

Ill. Typ. Lep. Het. iii. p. 31, pl. xlviii. fig. 7 (1879).

Crocallis obliquaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 282 (1895).

There were several specimens in Pryer's collection from Yokohama and Oiwake. I have also received the species from Kiushiu, taken by a native collector, and I met with it at Oiwake and Nikko in September.

My collectors in Western China obtained it at Moupin, Pu-tsu-fong, and Chow-pin-sa in June, but only single specimens in each locality. The Moupin example agrees in colour with the Japanese specimens, but the others are much darker.

Distribution. Japan; W. China.

— *Crocallis* (?) *acuminaria*, sp. n.

Ochreous brown. Primaries traversed by two blackish transverse lines, the first almost straight and the second oblique, angled near costa and outwardly edged with whitish; there is a semihyaline spot on costa extending to angle of second line and intersected by nervule; discal spot black: secondaries have an incomplete waved central blackish band, a faint discal spot, and a dusky cloud at anal angle. Under surface light brown; primaries marked as above, but the transverse lines are finer and the second is followed by some blackish dots on the neuration, instead of being edged with whitish: secondaries freckled with brownish grey; transverse band extends only to discal spot, and there are indications of a submarginal line.

Expanse 40 millim.

One female specimen from Che-tou, July.

Hab. Western China.

Genus *PACHYLIGIA*.

(Butler, Ann. & Mag. Nat. Hist. (5) i. p. 442 (1878).)

Pachyligia dolosa.

Pachyligia dolosa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 442 (1878);
Ill. Typ. Lep. Het. p. 50, pl. liii. fig. 5 (1879).

- Several specimens from Yokohama in Pryer's collection.
Hab. Japan.

Pachyligia modesta.

Pachyligia modesta, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 443 (1878);
Ill. Typ. Lep. Het. iii. p. 50, pl. liii. fig. 6 (1879).
♀. *Cymatophora tristis*, Leech, Proc. Zool. Soc. 1888, p. 652, pl. xxxii.
fig. 8.

Several specimens from Yokohama in Pryer's collection.

There were two females of this species among Pryer's unidentified insects; one of these I erroneously described as a distinct species under the name *Cymatophora tristis*.

Some of the specimens are unicolorous, others have a darker central band.

Hab. Japan.

Genus *ZETHENIA*.

(Motsch. Etud. Ent. p. 34 (1860).)

Zethenia rufescentaria.

Zethenia rufescentaria, Motsch. Etud. Ent. p. 35 (1860).
Zettienia rufescentaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 102.

Several specimens from Yokohama in Pryer's collection.

I captured examples of the type form at Gensan, and my native collector obtained the species at Hakodate in June.

There are two distinct colour-forms of this species; one is of the typical brownish, the other is pale whitish grey, with space between the inner and outer lines filled in with blackish. I took specimens of this form, for which I propose the varietal name *grisearia*, at Nagasaki in May and Fushiki in July. There was one example of this form in Pryer's collection.

Hab. Japan, Yesso, Kiushiu, and Corea.

— *Zethenia contiguaria*, sp. n.

Somewhat similar in appearance to *Z. rufescentaria*, Motsch., but darker in colour. The first line of primaries is angulated below the costa; the wavy second line is dotted with black on the neuration as in *Z. rufescentaria*, but it is inwardly edged

with whitish towards inner margin and is preceded and followed by a diffuse fuscous-brown transverse band; discal spot black: secondaries have a black discal spot and a wavy blackish transverse line, the latter preceded and followed by fuscous-brown bands as on primaries. Underside paler, markings very similar to those of upper surface.

Expanse 42-44 millim.

Several specimens from Ichang, Chang-yang, Moupin, Omei-shan, Chia-ting-fu, and the province of Kwei-chow: July.

Hab. Central and Western China.

Zethenia albonotaria.

Selenia albonotaria, Brem. Lep. Ost-Sib. p. 73, pl. vi. fig. 16 (1864).

Zettienia albonotaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 102.

Several specimens from Yokohama in Pryer's collection.

I obtained the species at Nagasaki, Ningpo, and in Satsuma in April and May. My native collector captured examples at Hakodate in June.

One of the specimens from Ningpo and one from Nagasaki seem to agree with *consociaria*, Christ.

Distribution. E. Siberia; Japan; Yesso; Kiushiu; North China.

GENUS SELENIOPSIS.

(Warr. Novit. Zool. i. p. 402 (1894).)

Seleniopsis evanescens.

Endropia evanescens, Butl. Trans. Ent. Soc. Lond. 1881, p. 404.

Seleniopsis evanescens, Warr. Novit. Zool. i. p. 402.

There were specimens from Yokohama, Ohoyama, and Nikko in Pryer's collection. I captured the species at Hakodate in August, and my native collector took it in the island of Kiushiu.

Hab. Japan, Yesso, and Kiushiu.

Seleniopsis grisearia, sp. n.

Greyish white. Primaries powdered with darker grey; discoidal spot black, linear; beyond this, on the costa, is an almost white spot followed by a small blackish cloud; secondaries powdered with darker grey on abdominal margin, especially towards anal angle, where there are traces of two dark transverse lines. Fringes dark grey, spotted with blackish

at the ends of the nervules. Under surface brownish grey, tinged with violet; outer margin of primaries bordered with violet-grey, costal area striated and powdered with brown, discoidal and costal spots as above, but the latter is surrounded with black; secondaries are freckled with brownish and clouded with violet-grey below the black linear discoidal spot; above the anal angle there is a short whitish diffuse line, edged inwardly with violet-grey.

Expanse 38 millim.

One male specimen from Moupin, July.

Hab. Western China.

Closely allied to *S. evanescens*, Butl., and perhaps only a local form of that species.

Genus ANONYCHIA.

(Warr. Proc. Zool. Soc. Lond. 1893, p. 412.)

— *Anonychia grisea*.

Nadagra grisea, Butl. Proc. Zool. Soc. Lond. 1883, p. 172.

Onychia grisea, Swinhoe and Cotes, Moths of India, p. 574 (1887).

Anonychia grisea, Hampson, Fauna Brit. Ind., Moths, iii. p. 178 (1895).

I have specimens from Moupin, Ta-chien-lu, Pu-tsu-fong, Wa-ssu-kow, taken in June and July.

Distribution. N.W. Himalayas; Sikkim; Khásis (Hampson); Western China.

— *Anonychia latifasciaria*, sp. n.

Allied to *A. grisea*, Butl. Primaries greyish, powdered and freckled with brownish; the central band, which is intersected by a blackish sinuous line, is broad and darker, especially towards the edges; the inner edge of the band is curved about the middle; submarginal line diffuse, pale, wavy; secondaries fuscous grey, with a blackish, central, slightly curved line. Under surface fuscous grey; costa yellowish, freckled with black; the primaries have a blackish discal spot and a series of spots on the neurulation beyond; secondaries are much freckled and have a discal spot and a series of spots as on primaries. Fringes grey, darker at their base and marked with blackish at extremities of the nervules.

Expanse 32 millim.

Occurs at Omei-shan, Pu-tsu-fong, Ni-tou; I have one male specimen from each locality: July.

Hab. Western China.

Anonychia prœditaria, sp. n. (Pl. VI. fig. 4.)

Light brown. Basal half of primaries suffused with fuliginous and coarsely striated with blackish; there is a wavy blackish subbasal line and a curved one beyond, the latter increases in width towards costa, where it is almost black; limiting the basal half of the wing is a broad fuliginous undulated band, the outer edge of which is outlined with whitish and has an obtuse projection above its centre; there is a short transverse blackish streak from the costa before apex, and the outer margin is suffused with fuliginous. Secondaries have the basal two thirds suffused with blackish and limited by a pale line, which has a small bidentate projection about the middle; beyond this there is a series of dusky dots. All the wings have a blackish discal spot. Fringes of the ground-colour, chequered with darker. Under surface light brown, with a pinkish tint: primaries have a second line and the broad band of upper surface reproduced. Secondaries have the basal two-thirds limited by a series of black dots, and striated and freckled with blackish.

Expanse 42 millim.

One example of each sex from Moupin, and two males from Pu-tsu-fong, July.

Hab. Western China.

Allied to *A. mendica*, Butl.

Anonychia anomala.

Cidaria (P) *anomala*, Butl. Trans. Ent. Soc. Lond. 1881, p. 425.

Butler states that this appears to be a tolerably common species at Tokio. It was not represented in Pryer's collection, neither did I meet with it in any part of Japan that I visited.

I have a specimen from Pu-tsu-fong, taken in June or July, which seems to be referable to this species, but the markings on primaries are more pronounced.

Distribution. Japan; Western China.

Anonychia mendica.

Cidaria mendica, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 446 (1879).

There were four specimens from Nikko and Ohoyama in Pryer's collection. I took one example at Hakodate in August, and Mr. Smith one at Hakone in the same month. I have also received a male from Chang-yang.

In the Chinese specimen the outer edge of central fascia is bolder in outline.

Distribution. Japan; Yesso; Central China.

Genus EURYMENE.

(Dup. Cat. Léop. Eur. p. 220 (1844).)

Eurymene dolabraria.

Phal. Geometra dolabraria, Linn. Syst. Nat. xii. 861.

Geometra dolabraria, Esp. pl. 15. figs. 1, 2; Hübn. Geom. fig. 42.

Eurymene dolabraria, Dup. Léop. vii. pl. 148. fig. 5; Guen. Phal. i. p. 145.

Metrocampa dolabraria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 112.

There were four very typical specimens from Yesso in Pryer's collection.

Distribution. Europe; Yesso.

- *Eurymene subpurpuraria*, sp. n.

Pale brown. Primaries tinged with violet on the central and basal areas; there are three more or less quadrate marks on the costa, and there are some black dots on the third median nervule, at end of cell, and on nervule above. Secondaries have a blackish central band, but this is only distinct towards abdominal margin; there are some black dots as on primaries: all the wings have an indistinct blackish discal spot. Fringes pale brown chequered with slightly darker brown. Under surface: primaries buff, clouded, except on apical area, with reddish brown, and suffused with violet-grey; the costa is marked with reddish brown and whitish; secondaries clouded with brownish and blackish, the latter confined to the anal and central areas; a blackish discal spot on all the wings.

Expanse 50 millim.

One male specimen from Pu-tsu-fong, June.

Hab. Western China.

Genus PRIONIA.

(Hübn. Zutr. iv. p. 40; Hampson, Fauna Brit. Ind., Moths, iii. p. 175 (1896).)

Prionia paupera.

Oicarda paupera, Butl. Trans. Ent. Soc. Lond. 1881, p. 418.

A nice series in Pryer's collection, taken at Gifu and Oiwake.

Hab. Japan.

Prionia rosearia.

Prionia rosearia, Leech, Entom., Suppl. p. 56 (May 1891).

I obtained six specimens, including both sexes, in the Snowy valley, Ningpo, April.

The first of the central lines is not always clearly defined in some specimens.

There is an un-named example of this species, labelled "Chekiang," in the National Collection.

Hab. North China.

Genus *HETEROLOCHA*.

(Led. Verh. zool.-bot. Ges. Wien, iii. p. 207 (1853); Hampson, Fauna Brit. Ind., Moths, iii. p. 179 (1895).)

- *Heterolocha falconaria*.

Aspilates falconaria, Walk. Cat. Lep. Het., Suppl. v. p. 1665 (1866).

Heterolocha falconaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 179 (1895).

Two male specimens from Pu-tsu-fong and one female from Che-tou, July.

Distribution. N.W. Himalayas, Sikhim, Punjab (*Hampson*); Western China.

Heterolocha latifasciaria, sp. n.

Closely allied to *H. subroseata*, but the outer margin of secondaries is rounder in contour. The oblique band of primaries is marked towards costa with dusky spots, as in *H. falconaria*, Walk., but there is no apical spot as in *H. apiciaria*, and the band of secondaries is broader and more distinctly purple towards abdominal margin. The markings on under surface are purplish, with a slight grey tinge.

Expanse 32-34 millim.

Two male specimens from Ichang and one female from Chang-yang, June and July.

Hab. Central China.

- *Heterolocha subroseata*.

Heterolocha subroseata, Warren, Novit. Zool. i. p. 449 (1894).

A long series from Chang-yang, Moupin, Omei-shan, and the Province of Kwei-chow, June and July.

In some specimens the upper surface is more or less irrorated with fuscous, especially on the outer marginal area.

The markings are subject to modification as regards development: sometimes the basal patch of primaries is only indicated by a fuscous spot on costa, and the oblique transverse band is entirely absent; in these specimens, however, the purple patch on inner margin remains. In other examples the oblique band is well defined, but the marginal patch is eliminated.

Expanse ranges from 31–41 millim.

Distribution. Japan (Warren); Central and Western China.

Heterolocha stulta.

Hyperythra stulta, Bull. Ann. & Mag. Nat. Hist. (5) iv. p. 370 (1879).

A fine series from Ohoyama and Oiwake in Pryer's collection.

Varies in the intensity and definition of markings.

Hab. Japan.

Heterolocha notata.

Heterolocha stulta, var. *notata*, Warren, Novit. Zool. i. p. 449 (1894).

Male.—Primaries straw-colour, irrorated, especially on the costal and outer marginal areas, with fuscous; basal patch, a band before the discal spot, and one beyond pinkish, the latter attenuated towards costa, and followed by a pink-tinged fuscous transverse cloud. Secondaries straw-colour, paler towards costa and irrorated with fuscous; beyond the dusky discal spot there is a pinkish band, which does not reach the costa; a transverse pink-tinged fuscous band before outer margin. Under surface: primaries yellowish, irrorated with pinkish grey, whitish on inner marginal area. Secondaries whitish, irrorated with pinkish grey, yellowish on costal area; the transverse markings of upperside are reproduced but are not distinct.

Female.—Rather paler in colour.

Expanse 30–32 millim.

A number of male specimens from Chang-yang and Ichang, chiefly from the first-named locality, whence four females were also received, June.

Varies considerably in the intensity of the pinkish markings. In some examples these are very pronounced, whilst in others they are, to a greater or lesser extent, obsolescent. In one or two specimens the primaries are tinged with brownish.

Distribution. Japan (Warren); Central China.

Heterolocha fuscofasciaria, sp. n.

Whitish, irrorated with fuscous. Costal area of primaries suffused with brownish, and the basal area with fuscous grey; annular discal spot and oblique band fuscous grey, the latter commencing before the apex. Secondaries have a fuscous-grey central band. Fringes agree in colour with the bands. Under surface similar to above.

Expanse 26 millim.

One male specimen from Ichang, April.

Hub. Central China.

Nearly allied to *H. notata*.

Heterolocha aristonaria.

Hyperythra (?) *aristonaria*, Walk. Cat. Lep. Het. xx. p. 180 (1860).

Hyperythra nipponica, Butl. Ill. Typ. Lep. Het. ii. p. 46, pl. xxxv. fig. 2 (1878).

There was a nice series of both forms in Pryer's collection. I have also received examples of the typical form from Ichang and Chang-yang, and from the Province of Kweichow.

At Nagasaki I took the species in May, and afterwards met with it at Gensan in June, at Tsuruga in July, and at Hakodate in August.

This species is closely allied to, if it is not identical with, *H. laminaria*, Herr.-Sch., from Armenia.

Nipponica, Butl., cannot be specifically separated from *aristonaria*, Walk. Some of the specimens from Japan have the yellow colour of *aristonaria*, but the outer portion of all the wings, beyond the second line, is grey, as in *nipponica*; in other examples the marginal area is purplish red.

The males vary in size from 20 to 35 millim.

Distribution. Japan; Yesso; Corea; North, Western, and Central China.

Heterolocha rosearia, sp. n.

Yellow. Primaries pale pinkish on basal area, there is a tapered band of the same colour on the lower portion of outer marginal area; the costa is finely dotted and marked with black, and there is a pinkish apical spot edged inwardly with blackish. Secondaries have an ill-defined pale pinkish subbasal band, and the outer margin is broadly bordered with pale pinkish, except at outer angle; both this and the band on primaries inwardly edged with dusky.

Under surface bright yellow: primaries have the inner margin whitish; a purplish-red dash at base of costa, a sub-basal cloud, a spot at apex, and a cloud on inner margin near angle: secondaries have a subbasal band and a broad central one; the latter, and also the cloud on inner margin of primaries, suffused with greyish. All the wings have a discal spot of the same colour as the other markings.

Expanse 26 millim.

One male specimen from Chang-yang, July.

Hab. Central China.

Closely allied to *H. aristonaria*.

—*Heterolocha marginaria*, sp. n.

Sordid yellow, irrorated with purplish fuscous, especially on secondaries. Primaries have a pale purplish basal patch, and a border on outer margin of the same colour, the latter tapers towards apex and has a brownish circular patch on it at inner margin; discal spot dusky, indistinct. Secondaries have a purplish discal spot and central band. Under surface yellow, irrorated and mottled with fuscous mixed with purplish red: primaries have an outwardly diffuse oblique band from apex, an annular discal spot, and an irregular-shaped subbasal patch, all purplish red; secondaries have a purplish-red discal spot and central band.

Expanse 34 millim.

One male specimen from Moupin, July.

Hab. Western China.

—*Heterolocha quadraria*, sp. n.

(Pl. VI. fig. 8.)

Primaries olive-yellow, traversed by two blackish lines, each commencing in a black, more or less quadrate, spot on the costa, the first is almost straight and the second is twice angled below costa, thence obliquely wavy and edged outwardly with whitish to inner margin, where it expands into a blotch. Secondaries yellowish, freckled with violet-grey and traversed by a band of the same colour; the abdominal margin and anal angle are tinged with olive-yellow. Fringes of primaries concolorous, except towards apex, where they are dark; fringes of secondaries violet-grey, except at anal angle, where they are yellowish green. Under surface brownish: primaries suffused with fuscous; costal and outer marginal areas clouded with yellow; there are two diffuse dusky bands, corresponding in position with the lines of

upper surface: secondaries clouded with ferruginous, except on abdominal margin, and traversed by a dusky band. All the wings have a blackish discal spot on both surfaces. Head and thorax concolorous with primaries; abdomen agrees with secondaries above.

Expanse 32 millim.

One male specimen from Pu-tsu-fong, June. Three male specimens, Chang-yang, Pu-tsu-fong, Che-tou: July. McArthur took a specimen at Narkundah in April.

Distribution. Central and Western China; North-west Himalayas.

— *Heterolocho patalata*.

Heterolocho patalata, Feld. Reis. Nov. pl. 132, figs. 9, 9 a (1874); Hampson, Fauna Brit. Ind., Moths, iii. p. 180 (1895).

Two male specimens received from Ta-chien-lu, June.

Distribution. Rampur; Khásis (Hampson); Western China.

— *Heterolocho phœnicotæniata*.

Aspilates phœnicotæniata, Koll. Hüg. Kasch. iv. p. 487 (1848).

Heterolocho phænico-tæniata, Feld. Reis. Nov. pl. 133, figs. 6, 6 a (1874); Hampson, Fauna Brit. Ind., Moths, iii. 179 (1895).

One example from Japan in Pryer's collection.

Distribution. N.W. Himalayas (Hampson); Japan (Pryer).

— *Heterolocho grata*.

Epione grata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 369 (1879).

Gynopteryx lapidea, Butl. Trans. Ent. Soc. 1881, p. 403.

There were a number of specimens from Oiwake and Gifu in Pryer's collection, and amongst them examples of the larger and rather purplish-grey form *lapidea*, Butl.

Hab. Japan.

Genus VENILIA.

(Dup.; Hampson, Fauna Brit. Ind., Moths, iii. p. 180 (1895).)

— *Venilia triangulum*.

Cautoloma triangulum, Oberth. Etud. d'Entom. xi. p. 32, pl. ii. fig. 5 (1888).

Oberthür does not refer to the sex of his type. I have a

series from Ta-chien-lu, where the specimens were taken in May and June. The sexes do not differ either in colour or marking.

Hab. Western China.

—*Venilia Oberthuri*.

? *Caustoloma oberthuri*, Alph. Iris, viii. p. 201 (1895).

A nice series, including both sexes, from Ta-chien-lu, Pu-tsu-fong, and How-kow: June and July.

Hab. Western China and Thibet.

—*Venilia flavaria*, sp. n.

(Pl. VI. fig. 12.)

Similar to *V. triangulum*, Oberth., but the ground-colour is darker yellow, especially on secondaries; the brown marking on primaries is not continued along the inner margin to base; the band on secondaries is more pronounced and is continued as a short broadish streak along the abdominal margin. The dark costal border is uniformly straight, and not inwardly expanded about the middle as in *V. triangulum*.

One example of each sex from Chow-pin-sa, and a male from Pu-tsu-fong, June.

Hab. Western China.

—*Venilia lozonaria*.

Caustoloma lozonaria, Oberth. Etud. d'Entom. xviii. p. 24, pl. iv. fig. 57.

A series received from Pu-tsu-fong, Che-tou, Omei-shan, Ta-chien-lu: June, July, and August.

Hab. Western China.

Venilia (?) *invenustaria*, sp. n.

Whity brown, faintly striated with pale ferruginous on both surfaces.

Expanse 80 millim.

One female specimen taken by myself at Gensan in June.

Hab. Corea.

—Genus *LOZGRAMMA*.

(Stephens, Ill. Brit. Ent., Haust. iii. p. 258 (1829).)

—*Lozogramma petrarica*.

Geometra petrarica, Hubn. Geom. fig. 113; Esp. v. pl. 49. fig. 1.

Lozogramma petrarica, Steph. Ill. Brit. Ent., Haust. iii. p. 259.

Panagra petrarica, Guen. Phal. ii. p. 132.

Pseudopanthera petrarica, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 117.

Several specimens from Oiwake, Gifu, Nikko, and Yesso in Pryer's collection. A few examples were taken by my native collector at Hakodate and in the island of Kiushiu in June and July, and I have also received specimens from Ichang, Chang-yang, and Chia-ting-fu, where they were taken in June.

Distribution. Europe; Armenia; Amur; Japan; Yesso; Central and Western China.

Genus LOXASPILATES.

(Warren, Proc. Zool. Soc. Lond. 1893, p. 413.)

— *Loxaspilates obliquaria*.

Aspilates obliquaria, Moore, Proc. Zool. Soc. Lond. 1867, p. 649.

Loxaspilates obliquaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 181 (1895).

Eusarca subfalcata, Pouj. Ann. Soc. Ent. Fr. 1895, p. 812, pl. 7. figs. 14, 14 a.

I received specimens of this exceedingly variable species from Moupin, Omei-shan, Pu-tsu-fong, Ta-chien-lu, and from How-kow. Poujade records a female specimen from Moupin.

Distribution. Afghanistan; N.W. Himalayas; Sikhim (Hampson); Western China; Thibet.

— *Loxaspilates straminearia*, sp. n.

Primaries pale straw-colour, sparsely irrorated with brownish; there are indications of two brownish transverse lines (one on each side of the blackish discal dot), most distinct towards costa and inner margin; submarginal line wavy, but indistinct, and marked with blackish above the middle; fringes of the ground-colour, preceded by a series of blackish dots. Secondaries whitish, with a brownish patch rather below the middle of abdominal margin, and a smaller one near anal angle; fringes as on primaries. Under surface pale straw-colour: primaries have the basal half of the costal area suffused with fuscous and irrorated with the same colour beyond; there is an oblique fuscous transverse line marked with black on the costa, and the discal spot is blackish: secondaries sparsely irrorated with fuscous; the discal spot

is blackish and there are two fuscous bands beyond, both becoming indistinct towards costa.

Expanse 36 millim.

One male specimen from the summit of Omei-shan, July.

Hab. Western China.

— *Loxaspilates nigromacularia*, sp. n.

Whitish, sparsely irrorated with blackish on primaries and fuscous on secondaries. Primaries have two black transverse lines: the first is biangulate, and the second inwardly dentate and bordered outwardly with olivaceous brown; there is a rather large black discal spot; the submarginal line is indicated by a short black dash from costa, a >-shaped mark just below, and a similar mark towards inner margin. Secondaries have a blackish discal dot and dusky central band, the latter becoming indistinct towards costa. Fringes of the ground-colour, preceded on primaries by a series of black lunules. Under surface whitish: primaries suffused with fuliginous on basal two-thirds, markings of upper surface reproduced in dusky.

Expanse 34 millim.

One male specimen from Pu-tau-fong, June.

Hab. Western China.

— *Loxaspilates* (?) *trilinearia*, sp. n.

Primaries brown, with three silvery-white transverse lines each inwardly edged with dark brown; the first line is slightly oblique, the second is curved and recurved, and the third is biangulate; discal dot blackish. Secondaries whitish, irrorated and lined with brownish on abdominal margin, and suffused with the same colour towards outer margin; discal dot blackish. Fringes brown, rather paler on secondaries. Under surface whitish, sparingly irrorated with brownish, and tinged with the same colour on costal and outer marginal areas of primaries; all the wings have a blackish discal dot; the transverse lines of primaries are faintly reproduced and the secondaries have a dark brown submarginal band.

Expanse 34 millim.

One female specimen from Wa-shan, June.

Hab. Western China.

[To be continued.]

BIBLIOGRAPHICAL NOTICES.

The Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by W. T. BLANFORD.—*Moths.* Vol. IV. By Sir G. F. HAMPSON, Bart.

THE present volume completes Sir George Hampson's revision of Indian Moths, the Tortrices, Tineina, and Plume-moths being alone excepted. It comprises an account of the species which represent the large family Pyralidæ in India, Ceylon, and Burma; and concludes with an Appendix of addenda and corrigenda, bringing the previous volumes up to date.

At one time the family Pyralidæ was represented by a group of so-called "mother-of-pearl" moths which constituted a mere fraction of the supposed tribe Pyralites, whilst other groups, popularly known as "grass-moths" or "honey-moths," were separated as families of the tribe Crambites. Now the whole of these insects are very properly merged into one family, all those previously recognized families which had been distinguished by good structural characters taking their places as subfamilies. Of the more typical Pyralidæ many are of remarkable beauty, whilst a great number are of considerable interest on account of the almost endless modifications of their various organs, together with the development, sometimes on one part and sometimes on another of their structure, of tufts or brushes of hair, patches of thickened scales, or clear impressed patches, most of these characters appearing to be confined chiefly, if not solely, to the males. Now, although all these secondary sexual characters are very entertaining to the student, they need examining with the greatest attention, inasmuch as not a few of the species scarcely differ one from the other excepting in the position or the colour of some insignificant pencil of hair on a leg or wing; and, seeing that Sir George Hampson has conscientiously and methodically studied each family, genus, and species, not only in general structure, but having a due regard to these peculiarities, it is a mystery how he can have produced the present volume so quickly after the publication of Volume III.

It must be remembered that most of the Pyralidæ are very small moths of somewhat complex structure, and, owing to the delicate texture of their wings, it is frequently by no means easy to examine the venation; the use of benzine, to render the wing temporarily transparent, often causes it to fold or curl over in such a manner as to make a study of the veins impossible. If the species be a common one, a specimen (from no special locality) may be sacrificed, the wings being cleared of scales and mounted; but in the case of the rarer species the most careful study through a platyscopic lens is necessary.

Perhaps I am mistaken, but it has struck me in running through this volume that this very necessity for close examination into minute details in working out the species of *Pyralidæ* has had what most lepidopterists will consider a beneficent effect, in reducing the long strings of synonyms which are met with continually in the earlier volumes of the *Moths*. In Volume IV. they appear chiefly in the boldly marked groups, such as *Nymphula* in the *Hydrocampinæ*. However, in a work which will be an undoubted boon, not only to all collectors in the East, but to all living lepidopterists, it is hardly fair to criticize the author's views respecting the limits of species: if he concludes that the species of certain genera are subject to unlimited variation combined with very extensive geographical distribution, he has, by his unwearied industry, earned a full right to his opinions.

Taken as a whole, the four volumes of the *Moths of India* have, without question, been worked out in so masterly a manner and are so infinitely superior as text-books of families and genera to anything previously produced, that they must necessarily give a great impetus to the study of *Heterocerous Lepidoptera*.

A. G. BUTLER.

The Parasitic Diseases of Poultry. By FRED. V. THEOBALD, M.A., F.E.S. London: Gurney & Jackson, 1896. Pp. xv & 120.

THIS little book should prove useful not only to poultry-rearers but also to the scientist and veterinarian. It opens with an introductory chapter on parasites and parasitism in general, at the conclusion of which the author rightly insists on the importance of cleanliness and healthy surroundings for poultry—items too much neglected by the majority of poultry-keepers. For the purpose of description, the Parasites are divided into Animal and Vegetable; and the Animal Parasites are subdivided into (1) Protozoan Parasites, (2) Insect Parasites (fleas, lice, &c.), (3) Mite Parasites, and (4) Worm Parasites. These are again divided into their natural groups, and under each group the symptoms and appearances of the diseases, the parasites producing them, with their life-histories and mode of distribution, and the means of prevention and treatment, are fully dealt with. The last should be very valuable, especially as it is the outcome of the author's own experience; it would have been better, however, to have used the term "lime-washed" throughout, instead of, in most instances, the somewhat loose one, "whitewashed."

Commencing with Diphtheritic Roup, the opinion is expressed that though there may be three varieties of this affection, it is generally protozoan in nature. Its extreme contagiousness is certainly against this view, and such authorities as Cornil and Babes and Löffler favour the bacterial theory of its origin. On page 6 "Cornet" is evidently a misprint for "Cornil."

Ann. & Mag. N. Hist. Ser. 6. Vol. xix.

17

Passing to the Vegetable Parasites, the author does not seem to be so much at home as with the Animal. They are divided in rather a curious way, viz.: (1) the Dermatomyces, or cutaneous parasites, (2) the Perisporiaceæ or "Moulds," and (3) the Saccaromycetes. An *Aspergillus* is described as "formed of thin colourless filaments forming a matted layer or thallus, and a looser mass above, the so-called aerial mycelium." By the inoculation of the spores of *A. fumigatus* it is stated that "tuberculosis of the liver and lungs takes place." Although the next sentence renders the author's meaning clear, it is to be regretted that the term "tuberculosis," which is now applied only to a specific disease, should be used in an anatomical sense. The bacterial diseases are not described, as the author considers that they should be separately dealt with. Two appendices (one a complete list of the parasites attacking *Gallus domesticus*, the other a bibliography) and a good index complete the volume, which is illustrated with many capital woodcuts.

In spite of the blemishes mentioned above, the work supplies a distinct want and will prove a useful guide to the recognition and treatment of the parasitic diseases of poultry.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

December 2, 1896.—Dr. Henry Hicks, F.R.S.,
President, in the Chair.

The following communications were read:—

1. 'On the Affinities of the Echinothuridæ, and on *Pedinothuria* and *Elikodiadema*, two new Subgenera of Echinoidea.' By J. W. Gregory, D.Sc., F.G.S.

The Author summarizes and discusses the literature bearing upon the Echinothuridæ, and brings forward arguments to prove that the family is a member of the order Diademoidea, and is derived from the Pedinidæ, members of which are found in earlier rocks than the Corallian, which contains the oldest member of the Echinothuridæ, namely, *Petanechinus*. He maintains that the extreme flexibility and loose articulation of the plates of the living genera *Asthenosoma* and *Phormosoma* is due to the diminished calcification of the plates, and that these recent genera are extremely specialized forms, and not primitive,—the apparently primitive features of the family being secondarily acquired, not primæval.

A description is given of forms belonging to two new genera, described as *Pedinothuria*—a connecting-link between the Pedinidæ and Echinothuridæ; and *Elikodiadema*—which has a flexible test, is

a modified form of *Pseudodiadema*, and has probably arisen from the adoption of a deep-sea life resulting in diminished calcification of the test.

2. 'On *Echinocystis* and *Palæodiscus*, two Silurian Genera of Echinoidea.' By J. W. Gregory, D.Sc., F.G.S.

The Author gives a history of the genera *Echinocystis*, Salter, and *Palæodiscus*, Wyv. Thoms., redescibes their structures, and discusses their affinities. He concludes that *Echinocystis* is an echinid and not a cystid; and that *Palæodiscus* is an echinid and not an asterid. In order to prevent confusion, he suggests the name *Scolocystis* for a true cystid which was described by Hull as *Echinocystis*, some years after the latter name had been applied by Wyville Thomson to the fossil now concluded to be an echinid; and also suggests the name of *Discocystis* for the form named *Echinodiscus* by Worthen and Müller.

In discussing the affinities of *Echinocystis*, Wyv. Thoms., the two latest diagnoses of the Cystoidea (those of Prof. von Zittel and Prof. Haeckel) are considered, and it is contended that they do not enable us to draw any sharp line of distinction between cystids and echinids.

It is shown that the masticatory apparatus of *Palæodiscus* and *Echinocystis* explain the origin of that structure in gnathostomate echinids; and furthermore, it is suggested that *Echinocystis* renders probable the homology of the so-called 'calycinal plates' of the Echinoidea with the plates of the valvular pyramid of the Cystoidea, and not with the calyx-plates.

The Author gives synopses of the order Cystocidaroida of Prof. von Zittel, and of its two families, Palæodiscidæ and Echinocystidæ.

MISCELLANEOUS.

To the Editors of the 'Annals and Magazine of Natural History.'

The Generic Name of the River Crayfish.

GENTLEMEN,—It is unnecessary for me to reply to the Rev. Mr. Stebbing at any length.

(i.) Reference to vol. xi. of the Trans. Linn. Soc. will confirm the accuracy of my remark as to Leach's treatment of *Astacus* and *Nephrops*. I am surprised at Mr. Stebbing supposing that I cited an anonymous article of uncertain date.

(ii.) Mr. Stebbing appears to be unaware of rule 2 of the rules proposed by the British Association for zoological nomenclature. What is there said of Brisson applies literally to Gronovius, and the genera of the one author are as good as those of the other.

(iii.) Does not Mr. Stebbing know that 1758 has been well called by the most eminent of the exponents of the zoological works of

Linnæus "the zoological *ab urbe condita* of binominal chronology" ? and that before 1890.

(iv.) If Desmarest had not said that Leach's *Potamobius* was a river-crab one might have ascribed *Potamobius apud* Samouelle to Leach; but as it is, Samouelle must take the responsibility for his ill-advised method of using Leach's MSS.

(v.) Mr. Stebbing has no right to lead us to suppose that *Potamobius* was not preoccupied; he shows himself to be incapable of recognizing the name when it is absolutely forced under his eyes, for he says of Desmarest that he "would probably have accepted Leach's *Potamobius* had he ever heard of it," and that after I had quoted a sentence of Desmarest passing an opinion on the value of that very name. So entranced has Mr. Stebbing been by the details of my autobiography, that he has missed the kernel of my argument.

(vi.) How one text-book can copy another either peacefully or otherwise I know not; but, if Mr. Stebbing means to gibe at Huxley, Milne-Edwards, Carus, Claus, Gegenbaur, Hertwig, and Boas, he has been guilty of an offence of which I hope he has already repented.

I am, Gentlemen,

Your obedient Servant,

F. JEFFREY BRILL.

A Gigantic Cephalopod on the Florida Coast.

By A. E. VERRILL.

Mr. R. P. Whitfield has forwarded to the writer the following letter from Dr. Webb to Mr. J. A. Allen, dated St. Augustine, Fla., Dec. 8th, 1896:—

"You may be interested to know of the body of an immense Octopus thrown ashore some miles south of this city. Nothing but the stumps of the tentacles remain, as it had evidently been dead for some time before being washed ashore. As it is, however, the body measures 18 feet in length by 10 feet in breadth. Its immense size and condition will prevent all attempts at preservation. I thought its size might interest you, as I do not know of the record of one so large."

The proportions given above indicate that this may have been a squid-like form, and not an *Octopus*. The "breadth" is evidently that of the softened and collapsed body, and would represent an actual maximum diameter in life of at least 7 feet, and a probable weight of 4 to 5 tons for the body and head. These dimensions are decidedly larger than those of any of the well-authenticated Newfoundland specimens. It is, perhaps, a species of *Architeuthis*. Professor Steenstrup recorded many years ago a species of this genus (*A. dua*)*, taken in 1855 in the West-Indian seas; but his example was much smaller than the one here recorded.—*Amer. Journ. Sci.*, January 1897, p. 79.

* See Trans. Connecticut Acad. vol. v.; also Report U.S. Fish Com. for 1879, p. 51, pl. xii. fig. 4.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SIXTH SERIES.]

No. 111. MARCH 1897.

XXIV.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XVII. By Prof. M'INTOSH, M.D., LL.D., F.R.S.

1. On the Spawning of the Lesser Sand-eel (*Ammodytes tobianus*, L.).
2. On the Eggs and Young of the Pollack (*Gadus* ¹ *s*, L.).
3. On the Life-history of the Lump-sucker (*Cyclopterus lumpus*, L.).
4. On the Eggs and Young of the Bimaculated Sucker (*Lepadogaster bimaculatus*, Donov.).
5. On the Life-history of the Short-spined Sea-Scorpion (*Cottus scorpius*, L.).

1. On the Spawning of the Lesser Sand-eel (*Ammodytes tobianus*, L.).

Some years ago an account of the eggs and larvae of the sand-eels was given by the author in the 'Report of the Fishery Board'*, and little fresh light has been thrown on the oviposition since that date, though the able paper by Mr. A. T. Masterman gave much information about the life-history and the rate of growth†, as founded on a careful examination of a most extensive and valuable series from various parts of Scotland. His conclusions from the larval and young forms also fit in with the subsequent remarks.

* Ninth, p. 831 (1891); also M'Intosh and Prince, Trans. Roy. Soc. Edinb. vol. xxv. p. 858.

† Ann. & Mag. Nat. Hist., Oct. 1895, p. 282.

For many years we have been familiar with the appearance in vast numbers of the larval and early post-larval sand-eels in the bottom tow-nets in March ; but, though it was clear that deposition of the eggs from which these sprang could not have been longer distant than a month or six weeks, still the actually ripe adults had not been seen at the commencement of the year. They had, on the other hand, been examined and described in May, and even in the beginning of July. This year the storm from the 8th to the 11th of January tossed some sand-eels on shore, some of them with their distended bodies firmly encircled by worn valves of the cockle in which a hole had been pierced, as if, in the extremities of the situation, they had made an effort to plunge into anything. All were examples of the lesser sand-eel, ranging from $6\frac{1}{2}$ to $7\frac{1}{2}$ inches, one of the smallest being a male with the abdomen distended with nearly ripe milt, the male organs in this species being as large proportionally as the ovaries in the female. Some of the females also had the abdomen fully distended by ripe ovaries. The ovaries had a pale greenish-yellow hue, the individual eggs measuring about $\cdot 838$ millim., thus exceeding in size those of the larger sand-eel given in the account above alluded to. The oil-globule was about $\cdot 24$ millim., also exceeding that of the larger species. As the specimens had been dead for a day or two, the present appearances cannot be regarded as perfectly normal.

The simultaneous ripening of the eggs in such an ovary was well illustrated in this species, the surface of the organ being minutely botryoidal from the projecting axis of the eggs, which were arranged in a kind of mosaic. These eggs were slightly cloudy and the oil-globule was faintly greenish. This differs therefore from the perfectly fresh egg, which has a dull golden or honey-colour (pinkish orange by transmitted light). The larger sand-eel, again, has a greenish oil-globule, so that such a tint seems to be prevalent in the genus. The tint of the oil-globule, however, in the lesser sand-eel must undergo changes, since it is scarcely tinted in the larval fish after it rests on the surface of the sand.

One female in the six examples procured had ovaries almost spent, only a few ripe ova occurring towards the posterior end of the organs. The lean lanky body externally was diagnostic.

The difficulty with regard to the spawning of the lesser sand-eel is thus removed, and in consonance with what was supposed to be the explanation of the facts in 1891*. They

* Ninth Ann. Rep. Scot. Fish. Board, p. 333.

deposit their ova in the sand in December and January, and probably somewhat later, so that a succession of larval forms appears in March and April, and which, by-and-by assuming the pelagic stage, become as they grow larger a very important element in the nourishment of the food-fishes of our shores.

2. *On the Eggs and Young of the Pollack* (*Gadus pollachius*, L.)

Some years ago* a few remarks were made on the spawning period of this species. On the first occasion only preserved ova were forwarded by the able assistant fishery officer at Lerwick, Mr. Duthie, but the following season he sent a few fresh ova in sea-water; their condition, however, was unsatisfactory. This energetic officer nevertheless has lost no opportunity of filling up the gap in regard to this and other species requiring investigation. Since the foregoing remarks were published Mr. Holt obtained two ripe females (in the spring of 1891) off the west coast of Ireland, and, though no male could be obtained, they were fertilized with the milt of a cod. He found their diameter to be 1.13 millim. in the unfertilized condition, a size they for the most part kept after formation of the perivitelline space, though extremes ranged from 1.10 to 1.16 millim. Three days later they exhibited a very translucent embryo, devoid of pigment and with no free caudal region. He was unable to develop them further.

This year Mr. Duthie with difficulty procured a few fertilized ova on the 2nd May, and forwarded them at once. Unfortunately they were delayed in transmission, probably by the dense mist, and they only reached the laboratory about 5 P.M. on the 6th, the majority having succumbed. They measured 1.1430 millim., a size agreeing with that of the green cod and with some that were sent in solution in 1893. These had the tail becoming free from the yolk, but the condition was not quite normal, and the exterior of the capsule was covered with debris in all. The blastopore had closed and the tail was just commencing to extend beyond the yolk. The optic vesicles were distinct and the auditory vesicles were indicated by a minute clear ovoid area. Kupffer's vesicle was present. Moreover, a series of black chromatophores occurred on the head and along the sides of the body to the tail. The notochord appeared in the middle line, but the muscle-plates were indistinct though probably present.

* Tenth Annual Report, p. 268 (1892), and Eleventh Annual Report, p. 246 (1893).

The yolk had considerably diminished. At the sides of the embryo were groups of minute granules, the result in all probability of abnormal conditions.

Next day—that is, on the 7th May, the fifth day after fertilization—the ova were unhealthy and the development irregular. The lenses were now visible, and a prominence indicated the heart. The otocysts have two otoliths. The notochord is cellular, and the segmental tubes had formed. Posteriorly several large vesicles were at the seat of Kupffer's, and the tail seemed to be deformed. The black pigment-corpuscles were stellate in front of the otocysts.

On the 8th May one of the embryos had escaped from the capsule, the latter apparently being somewhat delicate; but whether this was due to the abnormal conditions, viz. the long journey and the great heat, is unknown. In this example the heart pulsed and an opercular aperture appeared behind it. The otocysts had moved forward, the pectoral folds were more distinct, and the muscle-plates more numerous. The notochord was multicolumnar. Kupffer's vesicle had various accessory vesicles connected with it by protoplasm. The tail extended a little beyond the yolk, which had a few pale wrinkles in front, and its surface was dotted with minute granules. In certain views finely branched processes projected from a black pigment-speck on the body to the surface of the yolk, evidently uncoloured prolongations which afterwards develop pigment. The black chromatophores on the head and along the edges of the muscle-plates were distinct, and some were slightly branched, especially on the head. In lateral views the pectoral expansions were prominent. When placed in pure sea-water after examination the embryo and its yolk rose rapidly to the surface. On the same date an embryo within the capsule was less advanced, and the heart presented no movement.

Twenty-four hours later (9th May) the extruded embryo still survived, and the changes undergone in this interval were as follow:—Considerable diminution of the yolk had occurred, but a rupture of the sac had taken place posteriorly. The eyes were more clearly outlined, and pigment was developing in them, while the choroidal fissure was prominent. The otocysts were much larger and had a rim. The heart pulsed and had endocardial papillæ. The pericardial space was large. The pectoral fins showed a thickened rim of epiblast. Kupffer's vesicle was still present. The black chromatophores were more distinct, though those of the embryo in the capsule were more branched. Both specimens perished at this stage.

The pollack (lythe), though not uncommon, has thus been

a somewhat difficult fish to deal with in regard to its ova. From information sent by Mr. Duthie they appear to come inshore after spawning, and are by no means rare in June, July, and August; but only an occasional fish is procured offshore by the long liners. It is an active form, and generally struggles so severely when hooked that it is brought up dead. Moreover, the egg-capsules seem to be easily affected in confinement.

In all probability the larval pollack thus closely approaches the larval green cod, the black pigment being even more distinctly developed along the sides. In the post-larval stage this pigment also probably collects into marked dorsal and ventral bands, with a general dusting on the sides posteriorly and a median line as in the cod and green cod.

Young pollack from 28 to 43 millim. long occur in numbers near the margin of the rocks about the end of July, while larger forms, ranging from 48 to 78 millim., are not uncommon in September. In October they reach the length of 4½ inches.

3. *On the Life-history of the Lump-sucker* (*Cyclopterus lumpus*, L.).

The eggs of this species are very abundant along the rocky margins from February to the end of May, or even somewhat later, one specimen having been procured on the 12th July, 1888. The colour of the eggs varies from reddish to straw-tint, and even greenish, while in a ripe ovary in the body of the fish it ranges from a beautiful amethystine lustre, through the various shades of dull yellow, to greenish. When the eggs are partly immersed in a crevice of the rocks and partly exposed, those on the latter surface are straw-tinted, while those in the pocket in the rock are of a faint lilac hue. The capsule is dense and minutely punctured, but presents no special thickenings or superficial wrinkles, except where the facets of attachment are situated. They are fixed together in considerable masses on the rocks, the water percolating readily through the interstices; but the hatching in confined tanks is somewhat uncertain, since decaying debris or the death of a few leads to putrefaction of the whole.

In the majority of instances the exposed surfaces of the masses of eggs present peculiar and smoothly rounded depressions, as if portions of the eggs had been scooped out by a predatory fish or mollusk. Such depressions are bowl-shaped—that is, wider at the top or surface and gently narrowing to the bottom. An attentive examination, however,

shows no mark of injury, such as would be caused by the teeth of a fish or by the rasping "tongue" of a shell-fish. The eggs lie evenly together, and their capsules are uninjured. In all probability, therefore, the depressions are due to pressure applied by a blunt surface immediately after deposition, when the mass is soft, and it may be by the snout or other part of the male as he fertilizes them.

The eggs are chiefly to be found from low-water mark to half-tide mark, often deposited in corners or in holes in rocks. They generally are exposed to the wash of the sea, at St. Andrews, for instance, facing the east.

In this condition they are eagerly eaten by the rooks, starlings, and rats. The food-fishes and others are also extremely partial to them. Thus, at the end of April it occasionally happens that codling caught off the rocks have their stomachs distended with the eggs of the lumpsucker. Even such small fishes as Yarrell's blenny take the same food.

The care which certain male bony fishes take of the eggs is well known, while Dr. Günther mentions only two cases in which females do so. In this country the males of the river bull-head, the lumpsucker, and the marine and freshwater sticklebacks are familiar instances.

Most authors who have described *Cyclopterus* have observed this feature in the male; indeed, it is sufficient under ordinary circumstances to try to push him off guard with a stick to bring it out clearly*. Various interpretations, however, have been placed on the habit, some supposing that the mere fact of the male being in the neighbourhood at deposition sufficed to account for its subsequent appearance near the eggs; while others, after Fabricius, bestowed considerable attention on the description of the instinct. In regard to the remarks of Fabricius, it is doubtful if the wolf-fish would be much inconvenienced by the attacks of the lumpsucker. Even in its postlarval condition the young wolf-fish makes an easy prey of the young lumpsucker.

As soon as the eggs are hatched the males are released, and the young spread themselves over the rock-pools in the neighbourhood in hundreds. It is unlikely, however, that they are dispersed by specially adhering to the body of the male, though they quickly cling to anything and even to each other. Their home for some time appears to be the littoral region, and especially the rock-pools, and they

* *Vide* Ann. & Mag. Nat. Hist. Aug. 1866, p. 81, "On the Paternal Instincts of *Cyclopterus*," by W. C. M.

are occasionally found in considerable numbers in August, when the larger examples caught with a hand-net measured about $\frac{1}{2}$ inch. They adhere to the blades of the tangles and other sea-weeds, and in the mazes of these find that safety (from the ready application of their suckers) which would be denied them in the open sea. They are also common in the neighbouring waters inshore, being carried hither and thither on the floating littoral sea-weeds, and thus frequently get into the tow-nets.

In February and March only ova are obtained. In May the newly hatched larvae are about 6 millim. in length or a little longer. They are tadpole-like, with the remains of yolk, while the marginal fins continuous dorsally and ventrally. The caudal has only embryonic rays, and there is a thickening (hypural) beneath the notochord in this region. The short breast-fins show indications of true rays. In Prof. Agassiz's* youngest stage the caudal was already partly separated from the dorsal and ventral embryonic fin, and yet the presence of yolk is not mentioned, while the length was only 4 millim. The foregoing, therefore, though larger, was less developed, as, indeed, his figure shows. He fancifully likens the outline to that of the armoured fishes of the Old Red Sandstone—*e. g.*, *Coccosteus*. By the twelfth day the fish has increased considerably in bulk and measures 6.75 millim. in spirit; and besides the disappearance of the yolk and the increase of pigment, the dorsal has now been transformed into two fins, a short crescentic first dorsal over the vent, having six true rays, and a second dorsal with eleven true rays, joined by a portion of the larval fin (which shows no embryonic rays) to the caudal, the upper region of which (the larval tail) has only embryonic rays to the notch†, ten true rays occurring beneath. The anal fin has ten rays and is joined to the caudal by a strip of larval fin without rays. In the figure of Professor Alex. Agassiz at this stage (*e. g.* his fig. 8, pl. iv.) the second dorsal shows thirteen rays, the anal fifteen, and no strip without rays intervenes between these fins and the caudal. He likens it at this stage to the young of *Batrachus*.

Professor A. Agassiz gives some excellent remarks concerning the coloration of these young forms. "In the youngest stages" (with true rays developing in the tail, or about the twelfth or thirteenth day in Britain) "the head, in a line drawn nearly vertically below the base of the anterior dorsal, is of a light chocolate-brown, with a darker brown band

* Proc. Amer. Ac. Arts and Sci. vol. xvii. July 1882, p. 286.

† The notch is absent in Professor Agassiz's figure (pl. iv. fig. 1).

extending from the nostrils above the eye to the base of the anterior dorsal. A light blue band extends from the rear of the eye to the top of the operculum and in front of the eye to the nostrils. A blue spot of similar tint is found at the posterior base of the dorsal and at the base of the caudal extremity of the posterior dorsal. The rest of the body is straw-coloured." When the dorsal and anal fins are first outlined from the marginal (Agassiz's pl. iv. fig. 4) he found them "usually of a bright olive-green, darkest towards the dorsal side, with the same blue band extending towards the operculum from the rear of the orbit, with one or two round blue spots above the level of the pectorals along the lateral line. Other specimens were of a bluish neutral slate-tint, uniformly spotted with darker pigment-cells, with the same blue band between the eyes, above the nostrils, and behind the eyes. This was also the colouring of the oldest of the young specimens caught (from 20 to 34 millim.), resembling in general the bluish colouring of the adult, only of a darker tint.

"The intermediate stages varied greatly in colouring; some were of a yellowish-brown, spotted with chocolate-coloured patches, with light greenish bands behind the eyes, and five roundish spots of the same colour along the lateral line, and a similar number of larger spots along the base of the posterior dorsal, extending in some specimens along the median dorsal line of the body to the coloured band extending between the eyes. Other stages, with a similar arrangement of elliptical spots of a bluish tint along the dorsal and lateral lines, were of a reddish-brown colour, with pigment patches of a darker greenish or of a brownish colour, the abdominal region being of a lighter colour."

In regard to the coloration of the British examples some slight differences from the foregoing careful description of the American forms occur. Thus at 12 millim., in June, the general tint is olive-brown, with an opalescent bluish bar running from the operculum to the eye, and then forward over the upper lip to the mouth, where those of opposite sides almost meet. Traces of the same hue occur on the cheeks and on the pectorals. A cross-bar of the same beautiful tint passes between the eyes, so that the whole forms an A, a pale furrow in front being caused by the premaxillary fold. The effect of these bands in many is heightened by a border of russet-brown. Others a little larger, again, have the body dappled with sinuous brown bands, so that it is more or less reticulated, and, in addition to the iridescent bluish bands just mentioned, have dots on the cheeks, bold touches of the same character along the sides and at the base of the pectorals, the

effect being heightened by the orange tint of the inner surface of the anterior rays. At 20 millim., when the lateral spines are developing, the pre-, post-, and interocular bands are still present, though the latter (often greenish) is less distinct. Above 20 millim. the body (as at 25 millim.) becomes more uniformly tinted, such as olive or bluish green, the ocular belts being indistinct; but at the size just mentioned (25 millim.) the sides of a green example are somewhat silvery, the first dorsal has a brown tip, and the orange tint remains in the pectorals, thus contrasting with the generally paler hue of the ventral surface.

It is interesting that in these small forms slight pressure causes the sucker to adhere to the dead animals. It is, of course, easily removed.

When 11 millim. long in spirit, in June, it conforms rather to the 20 millim. stage of Agassiz, since the first dorsal is long, fleshy at the base, and with crenations to represent rays at the tip. The breast-fins have increased in size, though they do not differ much in their relations to the posterior border of the dorsal, since that has been carried considerably backward by the elongation of the fin-rays. The second dorsal and the anal are prominent, and the caudal has no trace of the larval tail.

Little change ensues up to 17 millim., except the general increase in bulk, the deepening of the first dorsal, and the more evident crenations at the tip. When about 18 millim., however (in spirit), four rows of simple papillæ appear:—

(1) A line of minute and somewhat closely arranged papillæ along the dorsal ridge and extending from the posterior part of the head to the base of the first dorsal; behind the latter two rows occur, and they cease before the commencement of the second dorsal. (2) A line of small papillæ extending from the tubular nostril along each ocular ridge, and sloping downward along the dorso-lateral region, but ceasing opposite the first dorsal. (3) A series of five larger, but still simple papillæ, from a point above the base of the breast-fin to a vertical line from the vent. (4) A similar number along each ventral edge to the commencement of the anal fin. The third line has the best marked papillæ.

It is interesting that in the American examples Professor A. Agassiz found no trace of these papillæ in fishes 20 millim. long; yet the anterior part of the body, he observes, had assumed the somewhat angular outline characteristic of the adult, though the body as a whole was longer. Indeed, he found the spiny tubercles (of which the foregoing papillæ are the precursors) developed only to a slight extent in young

forms measuring 34 millim. The British examples are thus more precocious. Professor Agassiz also describes "a last row of somewhat smaller tubercles along the median line of the abdomen behind the ventrals." In all probability "median" should be "lateral," unless the American form specifically differs.

As the fish increases in length the second and third rows extend posteriorly and by-and-by become hispid with minute spines; the third especially presenting large crescentic eminences bristling with prominent spines, which, while occurring over the tubercle generally, also form a pectinate ridge distally.

In June the young lumpsuckers range from less than 10 to 23 millim., the smaller forms being more frequent at the beginning, the larger towards the end of the month. In those of 23 millim. the spiny tubercles are all better marked than at 19 or 20 millim. Thus, the second and third rows (lateral) extend to a line passing through the middle of the second dorsal and the anal. In full development each process in the row forms a multispinous tubercle. A row of small spinous tubercles also occurs at the lower border of the opercular region, one extending to the branchiostegal region. At this stage (23 millim.) the second dorsal has 11, the breast-fins 21, the anal 10, and the caudal 11 rays—these numbers agreeing for the most part with the full number in the adult. On the other hand, the young differs from the latter in the greater proportional size of the eyes, the larger proportional size and nature of the third and ventral tubercles, in the shape and condition of the first dorsal fin, and in the arrangement of the pigment. At this, as well as the previous stage, minute leeches are occasionally found on the skin.

In July eggs were once obtained in a fully ripe condition (viz. the 12th), but their deposition on the rocks would seem to be rare at this period. Young postlarval forms of only 6.5 millim. are still found at the surface, *e. g.* of St. Andrews Bay and the Forth, the majority, however, being between 11 and 30 millim. Many of an intermediate size are obtained in rock-pools. At 30 millim. all the rows of spinous tubercles are extremely prominent, the most conspicuous being four of the third row. This and the second row extend almost to the base of the caudal fin. Such a fish is much more rugose than the adult, whose rows of flattened tubercles contrast with the projecting ridges and their hispid tubercles in the young. The first dorsal fin at this stage has a tendency to be adpressed, so that its tip is guarded by the double row of spinous tubercles on the dorsum. Further, the flattened abdominal

surface behind the ventrals shows minute soft papillæ scattered over the surface, the precursors of the hispid processes of the next stage. At this stage, therefore, the young lumpsucker is armed at most points, a condition of great importance during its more or less pelagic existence.

During August the captured specimens (in spirit) range from 13.5 to 35 millim., most being above 20 millim. Large numbers are procured in the salmon stake-nets off rocky borders*, the young lumpsuckers adhering to sea-weeds which are stranded on the ropes, while some are procured in the ordinary bottom-nets. At 35 millim. the rows of hispid tubercles are more pronounced than in the previous stage. The first five of the third row are very large, the hardened distal region being more or less conical, with a pectinate crest of spines which have a slight inclination backwards. Each hardened tubercle moves freely on the softer skin around it. The most evident change, however, and it is one which appears at 31 or 32 millim., is the appearance of minute spinous processes on the skin between the larger rows of tubercles on the upper lateral regions and on the flattened surface behind the ventral sucker, as well as all over the head, the only area apparently free from them being the abdominal wall between the prominent third row and the lateral ventral series, the tip of the spines of which also present a slight inclination backwards. The double row of spinous tubercles behind the dorsal fin have increased in size, and form an efficient protection to the tip of the former when adpressed; and probably this is important, since the projecting fin would otherwise be readily seized by a predaceous fish. Three spinose tubercles occur on the lower edge of the opercular region. In contrast with the smooth flattened tubercles of the adult, therefore, the young lumpsucker is remarkably well armed.

Of the subsequent stages of this species the following may be given, viz. 2½ inches on June 1st †, probably a small example of the last year's brood; 5½ inches in July; 7 inches in August; and 6½ inches in December (covered with *Caligi*)—all these indicating the growth of upwards of a year, the latter example probably being about eighteen or nineteen months old. The sexual differences at an early age have not yet been fully worked out, and therefore it would be premature to draw conclusions on the subject.

* For example, off the East Rocks at St. Andrews, from which many interesting specimens have been presented by Mr. Turbyme.

† *Vide* a useful table by Mr. J. R. Tosh, M.A., B.Sc., Twelfth Ann. Rep. Fishery Board, pt. iii. p. 333.

4. *On the Eggs and Young of the Bimaculated Sucker*
(*Lepadogaster bimaculatus*, *Donov.*).

This fish is rather more characteristic of the southern and western than the eastern shores, though it is by no means rare on the latter or in the north of Scotland. The eggs are deposited towards the end of June (being most common in July and August) inside empty bivalve shells, such as *Venus*, *Pectunculus*, *Solen*, and *Pecten*, and also along with *L. Decandolii*, at Guernsey, in the interior of the hollow basal swellings of the curled tangles, the adult fixing itself beside the eggs by means of the sucker. The eggs are stated by Mr. Holt to have a long diameter of 1.37 millim. and a short one of 1.08, while the height is .68 millim. The preserved eggs have a long diameter of 1.14 to 1.37 millim. and a short one of .914 to 1.2 millim., while the height is .64 millim. These latter dimensions thus agree with those of Mr. Holt, taking the contraction caused by spirit into consideration. They are placed quite separately in most cases, though not with regularity, inside the shells, attached by a flattened surface of a peculiar structure. On the irregular surface of the cavity of the tangle they were somewhat close to each other; indeed, two or three were occasionally lifted together by the basal secretion, and they covered all the available surface. The attached or flattened surface is coated by an adhesive secretion, the micropyle, as Mr. Holt in his careful and accurate description observes, being in the middle. He found the aperture, however, closed, as was the case also in those examined here, the disks or bosses of the cilia or long papillæ of attachment occurring over it. A fine fibrillar secretion stretches over the whole of the attached surface, the fibres radiating from the micropyle outward towards the marginal fringe. The surface of the capsule (zona) in this region is closely studded all over with distinct pustule-like disks or bosses, from which cilia or processes project, the tip being often bifurcate and ending in long filaments. These and the fibrillar secretion just mentioned run into the fringe of fibres at the margin of the egg. In some views, however, the marginal fringe sprang from a series of large basal stems united with the secretion at the margin of the egg.

On the other hand, the upper arch of the flattened egg has its capsule so transparent that the ordinary punctures could not be satisfactorily made out in the preserved specimens, though such were formerly considered to be present.

From the observations of Mr. Anderson Smith*, who kept the adults of *L. Decandolii* in confinement till they deposited eggs, which they did all at once, it appears that they hatch on the twenty-eighth day. The circulation was noticed on the thirteenth day. Mr. Holt correctly states that the embryos are always horizontal in position; indeed, the shape of the egg would render any other position difficult. In this connexion it has also to be remembered that in the later stages the embryos make considerable movements in the eggs.

Mr. Holt found different degrees of development in the eggs of those he examined, and slight variations were also observed in those above-mentioned. The majority, however, in a given case were nearly alike in this respect. The examination of the ovaries of an example of *Lepadogaster Decandolii* captured in a hollow tangle at Guernsey shows that the mature eggs are accompanied by others of various sizes, the larger about half the size of the mature. This species may differ in some respects from the bimaculated sucker in regard to spawning. Black pigment is well developed before hatching. From the careful description of the larva, which measures from 2·8 to 2·9 millim. on hatching, given by Mr. Holt, the only difference in those examined (but whether *L. bimaculatus* or *L. Decandolii* is an open question, since the females of both species occurred inside this remarkable hatching-chamber) is the presence of scattered black chromatophores over the dorsum of the head. The somewhat regular rows of black specks along the sides of the body are characteristic even at this early period.

The young of the bimaculated sucker appear in the bottom-nets as post-larval forms in August and September, and they range from 5 to 5·5 millim. They probably remain, on emergence from the capsule, more or less in the shelter of their original home until the yolk-sac is absorbed and sufficient strength is gained for a free existence and the capture of prey. At this stage the larval tail is still present superiorly, with its embryonic rays, while nine true rays occur beneath. The minute black specks appear on the top of the head and under the jaw, with a few on the abdomen, besides the rows along the sides. The prominence of the alimentary canal inferiorly, with the vent posteriorly, is a feature at this stage. A disk-like thickening occurs on the site of the sucker, but the apparatus is little developed; yet even the indication of it is comparatively early, since the pelvic fins are generally late in appearing.

* Proc. Roy. Phys. Soc. Edinb. ix. p. 143, pl. vii. (1886).

At 6.5 millim. the larval tail is still present. The rows of closely arranged black specks go down to the ventral edge, but the median ventral region is free. Two marked pigment-lines exist ventrally on the lower jaw beneath the eye and at the opercular region.

At 10 millim. the lateral rows of chromatophores are still more definitely arranged, forming about four complete longitudinal rows on each side, besides minor specks, and the axis of the mandible is more or less horizontal instead of being upturned. The larval tail has almost disappeared, the only trace being the slender tip of the notochord, which slants upward to the dorsal edge of the fin, a true fin-ray occurring immediately beneath; but the marginal fin with embryonic rays connects it with the dorsal, in which true rays are developing. Rudimentary true rays also mark the first part of the anal fin. The sucker appears to be nearly complete, but is proportionally much smaller than in the adult, probably because the habits are less sedentary. These characters remain at 10.5 millim., except that there are now five short true rays on the proximal side of the slender tip of the notochord in the tail, and it is evidently rapidly disappearing. Such stages are met with in September and October.

In December the young bimaculated suckers reach 15.5 millim., and then are met with in the stomachs of food-fishes. Long before this stage all trace of the caudal notochord has disappeared. The tip of the snout is much more flattened and the eyes proportionally larger and more prominent. The sucker has also considerably increased in size.

In February the young are from 21 to 22 millim. in length and more or less resemble the adult, though the tail is large and shows two or three additional rays, that is about fifteen instead of twelve. The vent is now nearly median, whereas in those of 10 millim. it was situated at the commencement of the posterior third. It also presents symmetrical longitudinal rugæ which end in short papillæ around the aperture. The rays in both dorsal and anal fins are six (Day gives D. 5-7, A. 4-6). The anterior division of the sucker is minutely papillose, so that its free margin seems to be serrated, and the surface of the median area and two lateral arms is covered for some distance with the same papillæ. The surface of the larger posterior division is also minutely papillose, but the margin has none of the larger papillæ seen in the anterior division. A thin serrate or crenate membrane forms a broad border to the posterior half of its margin, and at this stage it is, in some at any rate, quite free from the margin of the sucker. A broad diaphanous and striated flap

runs from this forward to the base of the pectoral, thus resembling a miniature duplication of the former. The body is now variegated with reddish in the males, pale patches occurring along the dorsum. The ventral surface seems to be pale.

At 25 millim. the colours in a young male from St. Andrews in June are even more brilliant, the bright red of the eyes and the sides of the body being characteristic. The anterior margin of the first division of the sucker is now flattened out and the papillæ on the surface less distinct, while the marginal ones are flattened and more membranous. The accessory flap on the posterior half of the second division is united with the margin of the sucker (a feature, it may be, characteristic of the sex), so that there is no differentiation between them. The vent showed only longitudinal rugæ with the long median papilla posteriorly.

In July forms of 26 and 32 millim. were obtained, and they seem to be the continuation of the former series. The chief change is the increase of the fleshy folds of the lips superiorly and inferiorly. The latter form a semicircular flap on each side, with a posterior continuation, the former having the shape of a broad and continuous flap. In the females the distinction between the margin of the posterior division of the sucker and its broad accessory flap is present. The papillæ along the front margin of the anterior division are also distinct in the same sex.

In August specimens of 22, 25, and 33 millim. from Lochmaddy, North Uist, are in the collection. The smallest is thus only the length of that from St. Andrews in February, so that either the specimen had grown little or had been hatched very late the previous season, unless we are to suppose that very early deposition of ova occurs in the Outer Hebrides. The former is the more probable.

Adults of 53 and 54 millim. for females and 48 millim. for males are met with the same month, so that they would appear to be at least in their second year. The chief sexual distinctions externally appear to be, in the male, the greater breadth and more membranous condition of the frilled border in front of the anterior division of the sucker, thus giving a larger surface. Similarly the broad frill behind the posterior division of the apparatus is increased, and its folds have not the regular and definite pattern seen in the female. Moreover the frill is indistinctly separated from the sucker proper. The latter, in short, has no free rim, but runs into the frill. The testes of the male are small and compact, like those of the shanny.

On the other hand, the female presents a somewhat thicker rim at the front margin of the anterior division of the suctorial apparatus, and the whole of the horseshoe-shaped region is much more papillose, even the folds between two of the rays laterally being studded with papillæ. The semicircle formed by the hind edge of the posterior division of the apparatus stands freely out and is minutely papillose, while the marginal fringe is composed of symmetrical lobes pointed at the tip and with two accessory pinnæ at each side.

One of the chief sexual distinctions, however, is the great development of the papillæ of the vent in the female. These form long digitate processes inferiorly on each side, the lateral being further united with the upper so as to form a broad lobose frill. They extend as far as the tip of the median papilla and envelope it. A great contrast, therefore, exists between this species and *Lepadogaster Decandolii*, for the females of the latter at the spawning-season show only a series of short slender papillæ at the vent, the posterior papilla projecting almost as conspicuously as in the male of *L. bimaculatus*.

After spawning the ovaries both of *L. Decandolii* and *L. bimaculatus* present a uniform structure, the stroma of the organ in each being filled with what appear to be collapsed eggs, with thick walls and a central slit-like region. At first sight they appeared to resemble thick shrunken capsules from which ova had issued, but that they are ova undergoing change is more probable. The appearance differed from that usually seen in Teleostean ovaries, in which a crop of minute ova is almost always found under these conditions.

5. *On the Life-history of the Short-spined Sea-Scorpion* (*Cottus scorpius*, L.).

The short-spined sea-scorpion was one of the fishes very early examined in regard to spawning during the trawling work of 1884 and the following year. Comparatively little was known previously in regard to it. Thus Day, in his 'British Fishes,' states that "In Greenland, it has been observed to deposit its eggs on the sea-weed in December and January. Its eggs are very small, and in this country are extruded during the spring in the sand or pools in the rocks. The male is said to make a nest of sea-weeds and pebbles for the reception of the spawn; while he is believed to watch over, as well as protect, the young when hatched." On the other hand, Prof. Alex. Agassiz records the ova of certain American *Cotti* as pelagic, a feature very different from those

of our country, and probably requiring re-investigation. On the east coast, as at St. Andrews, the eggs of this fish occur abundantly in March attached to stones, tangle-roots, old shoes, tin vessels, and, indeed, almost anything convenient. They are found, again, somewhat earlier (February) at Gairloch and other parts on the west coast. The authors of the 'Scandinavian Fishes' * broach the idea that the roe of this fish may be fertilized before deposition, and suggest that the serrations on the inside of the breast-fins may be useful to the males for this purpose. There is no reason to suppose that in Britain the eggs are so fertilized; on the contrary, it is evident that they are not fertilized before deposition. As an example, a female specimen whose abdomen was distended had been isolated in a glass vessel, so that its movements were somewhat limited; and it is probable therefore that the deposition may have been hastened. It had been observed to be somewhat restless the previous day, and on the 1st March it rested quietly on the bottom of the vessel, and in a few seconds deposited a mass (as large as a duck's egg) of faintly pinkish eggs, keeping its breast-fins in active motion during the process, and then it dashed through the water, sending some of the eggs over the edge of the vessel. The mass of eggs was at first quite soft, though cohering together by a secretion; but they soon hardened, the capsules of the eggs adhering by facets to each other as in the lumpsucker, so that the egg-mass in such a case resembles a spongy structure into which water freely enters, and is retained in considerable quantity, even though the eggs are uncovered by the tide, a provision of some importance. They vary in colour from that first mentioned to roseate, orange, straw-colour, and deep red, and have a diameter of about 1.5 millim. to 2 millim. (Holt). The capsule is thick, tough, and resistant, and shows the facets or processes by which it adheres to surrounding eggs. It is minutely punctured under a high power, the punctures having as a rule a more regular (linear) arrangement than in the lumpsucker. Moreover, larger dots occur at intervals all over the surface, resembling those seen in the lumpsucker's eggs removed from the stomach of young cod. The yolk internally has several colourless oil-globules, from three to nine, as mentioned by Mr. Holt, and they vary in size from .015 millim. downward. The yolk itself is tinted pale brownish or faintly reddish brown. Mr. Holt, who carried on special observations on the eggs of this species at St. Andrews, could not make out the passage of the oil-globules through the yolk, as had been described by one of us

* Page 186.

in the gurnard; but, so far as observed in 1884, there was no reason to doubt that the oil-globules followed the same movements as in other forms. In the developing embryo the oil-globules coalesce, so that but a single large globule remains. In the tanks of the laboratory the eggs are readily eaten by other specimens of the same species.

The development of this form is somewhat slow, especially in cold seasons, so that masses of eggs with advanced embryos are often found in April, and even in May. Mr. Holt found the larval fishes on emerging from the egg 7.5 millim. in length, and this accords with our own experience. The yolk forms a comparatively small prominence ventrally, and the large oil-globule lies at its front inferiorly. "The head is large and broad; the profile of the snout abrupt; the eyes large and fully pigmented; and the ear-capsules, of about the same size as the eyes, lie close behind them. The mouth is open, but the lower jaw is at first immovable"*. The internal organs are well developed. The tail in May shows only embryonic rays. The breast-fins are large and fan-shaped. The heart and blood-vessels are in full activity, the returning blood streaming over the yolk, and finally entering the heart.

The coloration consists of a series of distinct black chromatophores over the head and a few about the base of the breast-fin. They form a broad band on each side of the abdomen over the yolk, and extend from the breast-fins to the vent. "Pigment of a bright yellow colour by reflected, and orange by transmitted, light occurs also at the base of the breast-fins, on the top of the head, and on the abdominal roof." The eyes are black, with a metallic lustre. "In the post-anal region the only pigment is a ventral line of black chromatophores, sometimes very small or absent in the anterior region, and ceasing before reaching the tail."

On the 10th October on one occasion a larval form resembling a sea-scorpion was captured in the tow-net. In general outline it resembled that figured in the 'Researches,' with the vessels coursing over the yolk-sac. The oil-globule remained at the anterior part of the yolk-sac. Small specks of black pigment occurred along the sides of the body, one set forming a row near the upper-lateral region. No distinct coloration was visible on the pectorals. The eyes were iridescent greenish, like the inner surface of *Haliotis*.

Hitherto it has been unusual to get larvæ at this season of the year, so that the deposition of such eggs must have been antedated by some months on this occasion, if the interpretation of the nature of the larva be correct.

* E. W. L. Holt, Sc. Trans. Roy. Dubl. Soc. v. 2, p. 21 &c.

Swarms of the early postlarval sea-scorpions, about 7 to 7.5 millim. (in spirit), are occasionally captured in the surface tow-nets, as in the Forth, *e. g.* in March and April—indeed, just after the absorption of the yolk. Such pelagic forms have only embryonic rays in the tail-fin. The body and tail are translucent, whilst the head and abdomen have a pale greenish hue with black chromatophores, and the eyes have a silvery lustre. A line of black pigment-specks runs along the ventral edge of the muscle-plates behind the vent almost to the tail.

Mr. Holt observed that the lower jaw is movable two days after hatching and that the vent is open. In our examples a thickening below the axis of the tail occurred. When six days old the length is 8.4 millim. and the yolk has diminished, while the oil-globule has been elevated to the gullet.

The young forms were kept in the tanks till the seventeenth day, but development proceeded slowly under the somewhat unfavourable circumstances. On the seventh day and during the two or three subsequent days the pigment made great progress, extending behind the vent, and passing from the dorsum down the sides. On the tenth day the yolk had disappeared, but the embryonic fin-rays were present only in the tail. The absence of food would, as Mr. Holt suggests, suffice to explain the slow progress, but not altogether, since in the open sea specimens of 9.5 millim. are occasionally procured in a similar condition, *viz.* having a membranous dorsal and anal, and only embryonic rays in the tail. Those in confinement, however, differed in having no trace of the ventral fins, and the thickening beneath the tail was better marked in the free forms, while spines on the gill-cover were also present.

In specimens of 7 millim. (in spirit) captured in the bottom-net in the bay, the head has much increased in size, the fish is thick-set, and the gill-cover has minute spines. Embryonic rays are well developed in the tail, and a thickening occurs beneath the notochord. The black pigment has largely extended along the dorsum to a line behind the vent, and it is more abundant on the head. Such a form contrasts with the slender and ill-nourished specimens reared in the tanks, for in the latter the abdomen was shrunken and the end of the gut distended, as if the vent were closed. The breast-fins, however, were large.

At the end of April and beginning of May pelagic forms of from 9.5 to 10 millim. are not uncommon at the surface, *e. g.* off the Isle of May. The body has now considerably increased in bulk, a series of sharp spines project from the gill-cover and two on each side of the occiput. The larval tail is

present, but it is bent upward by the development of the true rays inferiorly. The ventral fins appear as minute processes.

At 11 millim. many are still pelagic (17th May), and show the three anterior gill-spines—the occipital, superciliary, and nasal spines. The ventral fins are minute. The pigment approaches that of the adult stage, only it is not so largely developed. The larval tail is at the upper edge of the organ, and the marginal fin is continuous and has only embryonic rays.

They still occur as pelagic fishes in the tow-nets at 14 to 18 millim. The head and body are now larger and more deeply pigmented, the former being entirely covered, the pigment continuous with the dorsal and passing downwards to the cheeks and chin. A bold bar in many exists at the base of the breast-fins, another across the region of the first dorsal fin, and one at the second dorsal, the latter, moreover, extending downward on each side to the ventral edge. The pigment on the two latter bars in some is specially dense, though in others the tint is more uniform dorsally. The head is Cottoid in appearance, the superciliary ridge and the occipital tubercles with their spines being conspicuous. Three of the spines on the gill-cover are large, the fourth at the inferior edge being small. The boldness in the demarcation of the pigment gives the fishes a piebald aspect in spirit. The larval tail is represented in the smaller forms by the upturned notochord. True rays now occur in all the fins. The voracity of these young forms is remarkable. One of 16 millim., for instance, in captivity swallowed a young flounder not much shorter than itself, just as the larger examples cleared the young gunnels out of the tanks.

At 22 millim. (27th May, estuary of the Eden) the bar of pigment behind the vent has sent a process backward to the tail, but it goes no further than the basal region. Symmetrical white spots—one dorsal and two ventral—occur in this prolongation. The occipital and supraorbital tubercles are less prominent, but the supranasal are distinct. A large spine occurs on the gill-cover. The upper spine on the gill-cover (preoperculum) is largest. The first dorsal fin has 9 rays, the second 15, the variegated pectoral 16, ventral 3, anal fin 13. The caudal has 12 long rays besides 4 or 5 shorter at each edge. The chief difference, therefore, between this and the adult is the increase in the caudal, but the short basal rays probably disappear during growth.

In June they reach 23 to 24 millim. and in July 38 millim., with adult characters, the first dorsal having 9 rays, the second 16 rays, and the anal still constant at 13.

In September specimens 54, 65, and 85 millim. occur, the

first being considered by Mr. Tosh* as the young of the season at five and a half months. It would be difficult to separate that at 65 millim. from the same series, but one at 85 is considerably older, probably by a year (or, as Mr. Tosh puts it, one year and three months). The usual arrangement of the spines on the gill-cover in such forms is as follows:—A spine points downwards at the ventral edge of the preoperculum, two short spines project above, then the upper long spine, above which is the opercular spine. Two short spines occur on the suboperculum.

Those of 57 and 74 millim. in February represent specimens about a year old, while those of 98 millim. are in their second year or approaching it. One of these (98 millim.) had almost ripe eggs, so that the remark in the new edition of the 'Scandinavian Fishes,' that it does not propagate its species until about 150 millim. long, is not applicable to our country.

XXV.—*New Species of Hymenoptera from Central America.*
By P. CAMERON, F.E.S.

DURING the course of publication of my work on the Hymenoptera of Central America (Biol. Centr.-Am., Hymen. vols. i., ii.) the following new species have come to hand, too late to be inserted in their proper places. As it will be some time before the Supplement of the 'Biologia' can be commenced, it is considered advisable to publish the following preliminary descriptions.

Fam. Cynipidæ.

ANDRICUS.

Andricus, Hartig, in Germar's Zeitschr. ii. p. 185.

Aphilothrix, Foerster, Verh. zool.-bot. Ges. Wien, 1869, p. 335.

This is a dimorphic genus, *Andricus* being the spring bisexual and *Aphilothrix* the autumnal agamic (unisexual) form.

Andricus (Aphilothrix) astescus, sp. n.

Aphilothrix (?) *astescus*, Cameron, Biol. Centr.-Am., Hymen. i. t. xx.
fig. 28.

Ferrugineous; alis hyalinis, nervis pallide flavis.
Long. fere 4 millim. ♀.

Hab. Mexico, Northern Sonora (*Morrison*).

* Twelfth Ann. Report Scot. Fish. Board, part iii. p. 338.

Head and thorax closely, finely, rugosely punctured, the mesonotum finely transversely striated; a longitudinal furrow outside the parapsidal one, reaching to the apex, but not to the base of the mesonotum; the scutellum is more strongly punctured than the mesonotum; the sternum and the lower part of the mesopleuræ black. Antennæ entirely ferruginous. The tips of the mandibles black. Abdomen of a lighter tint than the thorax, shining. The legs have the tarsi lighter coloured than the tibiæ or femora.

I believe this is a true *Andricus* (*Aphilothrix*). The third joint of the antennæ is hardly one third longer than the fourth; the parapsidal furrows are distinct and complete; the foveæ at the base of the scutellum are broad, not very acutely separated; the metanotal furrows are straight and parallel. The radial cellule is entirely open at the fore margin, the areolet obsolete. The claws have only one tooth.

Fam. Chalcididæ.

Subfam. CHALCIDINÆ.

Smicra ardens, sp. n.

Long. fere 6 millim.

Hab. Mexico, Orizaba (*F. D. Godman and H. H. Smith*).

Antennæ deep black, with a bright clear yellow line on the underside of the flagellum, which is stout and thickly covered with short black microscopical hair. Head lemon-yellow, the occiput for the greater part black; the centre of the vertex black, and from this runs a narrow black line to the bottom of the occiput; on the top and in front the head is thickly covered with black hair. Thorax lemon-yellow, covered rather thickly with black hair, the hair being longest on the scutellum. The mesonotum in the centre is transversely striolated, the sides coarsely punctured; at the base is a black transverse line, narrowed at the sides; from this runs to the scutellum a broad black line, narrowed at the base, dilated towards the apex, which has also a transverse line in front of the scutellum; down the centre of the scutellum is a black line, narrowed at the apex. The mesopleuræ and the sternum are for the greater part black, the former having an irregular yellow mark under the tegulæ in front and a smaller one obliquely under it over the sternum; the metapleuræ are yellow, bordered all round with black. The apex of the scutellum is margined, narrowed to a blunt rounded point at the tip. The median segment is short, not much longer

than the petiole, irregularly reticulated. The abdomen is nearly as long as the head and thorax united; the apical segment entirely, the base, sides, and apex of the second segment, and the apices of the other segments black. The legs are of a paler, more lemon-tinted yellow than the thorax; there is a black line, dilated at the apex, down the centre of the coxæ; the hind trochanters, a small mark near the centre of the hind coxæ above, a large irregular mark at the base, a smaller one at its apex, both being united by a curved line along the lower side, a short line on the top of the middle femora, and a mark at the base of the hind tibiæ black; a large irregular mark on the inner side of the hind coxæ at the foot, and a smaller, narrower, more elongate one above it black. There are sixteen femoral teeth of moderate size, blunt, and becoming smaller towards the apex. In the wing at the cubitus there is a small fuscous cloud.

Smiera divinatrix, sp. n.

Coccinea, flagello antennarum nigro; alis fere hyalinis.
Long. 7 millim. ♀.

Hab. Honduras, Ruatan Island (*Gaumer*).

Head and thorax covered with black pubescence, the pleuræ with the pubescence shorter and paler. Flagellum of the antennæ deep black, covered with short, close, blackish pubescence. Head uniformly coloured, except that the lower part of the cheeks is paler, the tips of the mandibles black, the vertex closely punctured; the front transversely striated. Prothorax sharply margined in front, the pronotum (especially at the sides) longitudinally striated. Mesonotum transversely striolated, the lateral lobes only on the inner side; the outer side with scattered punctures. Scutellum strongly and closely punctured, except behind. The median segment strongly reticulated. The propleuræ impunctate, shining; the mesopleuræ striolated in front, the top and bottom punctured. The petiole short and thick, hardly half the length of the hind coxæ. Abdomen shining, the sides sparsely haired, the ovipositor deep black. The legs coloured like the body, shining, sparsely covered with pale hair; the tips of the tarsi blackish; the hind femora with nineteen short black teeth. Wings with a smoky tint; the nervures fuscous; a small fuscous tint below the stigmal branch.

Smicra fasciola, sp. n.

Coccinea; flagello antennarum lineisque mesonoti nigris; alis hyalinis; femoribus posticis multidentatis.
Long. 4-5 millim. ♀.

Hab. Mexico, Northern Sonora (*Morrison*).

Antennal flagellum deep black, covered with a close pale pubescence; the scape pale ferruginous, lined with black above. Head closely covered with blackish pubescence; the lower part of the occiput and a broad line on the lower part of the front black; face shining, the sides obscurely punctured; the front obliquely striated from the ocelli to the eyes; the vertex punctured, but not strongly; the teeth of the mandibles black. Pronotum coarsely, rugosely punctured; mesonotum not quite so coarsely punctured, the middle lobe strongly transversely striolated, covered with short black hair; the scutellum still more strongly punctured, its apex roundedly margined, covered with much longer hair than the mesonotum; a transverse line bordering the base of the mesonotum. The edges of the middle lobe of the mesonotum, a broader stripe down its centre, a small mark on the centre of the lateral lobe and a line down the centre of the scutellum, the base and sides of the median segment, a broad line down its centre, a line on the mesopleura, becoming gradually wider towards the bottom, a mark at the base of the metapleuræ, a line down the hinder coxæ, and the coxal teeth deep black. The petiole short, not much longer than broad, black above; the dorsum of the abdomen more or less black; the apex of the ovipositor black. Wings almost hyaline; the nervures fuscous.

Allied to *S. flammeola*, Cresson.

Smicra armillata, sp. n.

Nigra, punctata, pedibus abdomineque rufo-maculatis; alis hyalinis.
Long. fere 5 millim. ♂.

Hab. Mexico, Orizaba (*F. D. Godman and H. H. Smith*).

Antennæ a little longer than the head and thorax united; stout, covered with a pale microscopic down; the scape keeled broadly beneath, especially towards the apex. Head coarsely punctured, not very deeply or broadly excavated in the front, covered with short white hair. Mesothorax coarsely punctured, without longitudinal furrows; the pronotum as closely but not so strongly punctured. The scutellum is as strongly punctured as the mesonotum, rounded and stoutly

margined behind. The median segment is strongly rugosely punctured; in its centre are two keels near each other at the base, then near the middle curving towards the sides. The pleuræ are strongly and coarsely punctured, especially the metapleuræ. The abdomen is a little shorter than the thorax; the petiole is about three fourths the length of the abdomen, which is shining, impunctate, ferruginous, darker towards the apex. The apical half of the fore femora and the fore tibiae and tarsi testaceous; the middle tibiae are infuscated; the hind legs are black, the femora broadly ferruginous at the base on the inner side, the tarsi pale testaceous. The wings are hyaline, iridescent, slightly suffused with fuscous; the nervures deep black.

In the large number of teeth (eighteen) on the hind femora and in general coloration this species agrees with *S. petioliventris*, Cam., from the Pacific slope of Guatemala; but it is much larger, the petiole is longer and narrower, the thorax is without markings, and the abdomen is ferruginous.

Subfam. PERILAMPINÆ.

PERILAMPUS, Latr.

There are six described species of this genus from North America and one from the West Indies. The genus is moderately represented in Europe. Nothing seems to be known of the habits of the species.

Perilampus mexicanus, sp. n.

Nigro-cupreus, albo-pilosus, abdomine caruleo, geniculis, apice tibiarum coxisque flavis; alis hyalinis, nervis flavis. ♀.
Long. 4 millim.

Hab. Mexico, Vera Cruz (*H. H. Smith*).

Antennæ stout, black, the tip testaceous; the scape blue, bare, furrowed beneath, especially towards the apex; the flagellum covered with a close white pubescence. The face for the greater part black; the part immediately below the antennæ bare, blue, the rest densely covered with white hair; the vertex green, with golden or coppery tints, finely punctured; the tips of the mandibles testaceous; the vertex and the sides of the excavated face margined. Thorax above coarsely rugosely punctured, reticulate at the sides and in front, black, with green and coppery tints, densely covered with white hair; the outer edge of the mesonotum smooth and impunctate; the scutellum is more coarsely punctured

M. P. Cameron on new Species of

mesonotum, the apex margined, rounded; the mesonotum shining, impunctate, the edges with large deep punctures; the propleuræ rugosely punctured. The abdomen shining, impunctate, bearing white hair. Legs green, with short white hair; the extreme apex of the hinder tibiæ, the apical third of the middle tibiæ, the greater part of the anterior tibiæ, all the knees, and the tarsi yellowish, the tarsi of a paler yellow than the tibiæ.

Perilampus antennatus, sp. n.

Long. 2.5 millim.

Hab. Mexico, Vera Cruz (*H. H. Smith*).

A smaller species than *P. mexicanus*, from which it differs in having the flagellum of the antennæ entirely testaceous beneath, the body uniformly coloured (wanting the green and coppery reflections), the scutellum larger and more pointed, and the legs darker in colour.

Antennæ moderately stout; the scape dark blue, shining, almost bare; the flagellum covered with a pale pile, testaceous beneath, black above. Head black, finely punctured above, and with a close short pile; the face shining; the central part broadly triangularly dilated, the base of the triangle raised and separated by a furrow from the rest; the tips of the mandibles testaceous. The thorax above is closely punctured, the lateral lobes of the mesonotum only slightly punctured and more shining than the rest. The scutellum is large, coarsely punctured; the apex margined, projecting a little over the apex of the median segment. The propleuræ with large widely separated punctures in front; the mesopleuræ excavated in front, shining, the edges with large deep punctures. The abdomen short, shining, very dark blue. The legs are black, covered with long white hair; the knees, the apex of the four hinder tibiæ, the fore tibiæ in front, and the tarsi testaceous, the extreme tips of the tarsi blackish. The wings are clear hyaline, the nervures testaceous.

Fam. Trigonaliidæ.

TRIGONALYS, Westw.

It is evident that this genus will prove to be numerously represented in Central America. I have called the family Trigonaliidæ; but Foerster, it may be remarked, has named it Diplomorpha, distinguishing it from his *Eutrichocera* (= *Stephanus*) by the scape of the antennæ not being filiform.

and by having the first abdominal segment not petiolate (cf. 'Ueber den systematischen Werth des Flügelgeäders bei den Hymenopteren,' p. 23).

From Smith finding *Trigonalys bipustulata* in a nest of *Polistes lanio*, it is probable that the genus is parasitic in wasp nests (cf. Smith, Trans. Ent. Soc. Lond. i. (n. s.) p. 176).

The six species here described may be separated as follows:—

- 1 (2). Scutellum pyramidal, bifid at the top *scutellaris*.
- 2 (1). Scutellum flat, not divided at the top.
- 3 (4). Body yellow, marked with black; second cubital cellule petiolate *maculifrons*.
- 4 (9). Body black, marked with yellow; second cubital cellule not petiolate.
- 5 (6). Abdomen fulvous, banded with black *apicipennis*.
- 6 (5). Abdomen black, narrowly banded with yellow .. *flavonotata*.
- 7 (8). Thorax with many yellow marks; the wings not smoky in front.
- 8 (7). Thorax with few yellow marks; the wings broadly smoky in front. *fasciipennis*.
- 9 (4). Body black, the petiole white; wings violaceous.. *Championi*.

Trigonalys scutellaris, sp. n.

Nigra, postscutello maculisque 2 metanoti, tibiis tarsisque flavis; alis fulvo-hyalinis. ♂.

Long. 10 millim.

Hab. Mexico, Omilteme in Guerrero, 8000 feet (*H. H. Smith*).

Antennæ entirely black, covered with a short black microscopic down; the third joint distinctly shorter than the fourth. Head impunctate, shining, densely covered, and the mandibles also, with long dark fulvous hair, the mandibles entirely black. Thorax densely covered with long dark fulvous hair, above coarsely rugosely punctured; postscutellum pyramidal, yellow, depressed in the centre above, making it bidentate; the teeth blunt, rounded at the top; at its sides the thorax is crenulated. The median segment coarsely reticulated, the apex in the middle coarsely transversely striolated, its extreme apex being also crenulated behind the reticulated part; the pleuræ irregularly reticulated, the base of the propleuræ and the apex of the mesopleuræ smooth, the metapleuræ more strongly reticulated than the mesopleuræ. Abdomen shining, impunctate; the base of the third and sixth segments transversely, and of the fourth and fifth segments more broadly, at the sides yellow;

the seventh segment fulvous, blackish in the centre, and with two small yellow marks; the ventral segments entirely black, shining, shortly and sparsely haired.

In the above described example the neururation of the wings is irregular; the stigma is black; the nervures are fuscous; the basal abscissa of the radius is oblique, straight; the first transverse cubital nervure is curved. In one wing there are two transverse cubital nervures between this latter and the normal first and third, and in the other one beyond the usual number, the position being irregular in both, the size of the cellules, too, showing a difference.

A second specimen from Omilteme is probably a variety of the same species. It is a little smaller; the scutellum is not so sharply peaked and hardly bifid; there is no mark on the median segment and no yellow lines on the abdominal segments. The alar neururation appears to be fairly normal; the first transverse cubital nervure is obliquely curved and is almost (in one wing quite) united to the second and to the apex of the basal abscissa of the radius; the second nervure is slightly oblique, the third almost straight; the first recurrent nervure is received quite close to the first transverse cubital, the second shortly before the middle of the cellule.

Trigonalys maculifrons, sp. n.

Flava, nigro-maculata; alis hyalinis, anticis fumatis, nervis fulvis. ♀.

Long. 11 millim.

Hab. Mexico, Teapa in Tabasco (*H. H. Smith*).

Antennæ rufous, the base of the flagellum blackish; the scape black above; the third and fourth joints about equal. Head lemon-yellow; the upper part thickly covered with short fuscous hair, the oral region and the mandibles with longer white hair; the teeth of the mandibles, a line from the end of the vertex to the antennal tubercles, becoming gradually wider to the apex, dilated at the sides, and enclosing a yellow mark, broader than long, below the ocelli, a somewhat oval mark on the occiput, from which (but not touching it) a broad line runs to the eye, which it joins, and behind the top of the eye a somewhat triangular mark, black. The mesonotum is coarsely punctured, thickly covered with short fuscous hair; the parapsidal furrows are distinct; on the outer side of these is a black line reaching to the scutellum, and there is an equally broad line (but narrowed at the base) down the centre; the scutellum is bordered at the base and sides with black, and in the apex in the centre is a black

mark, triangularly pointed at the base and the apex, the extreme apex being bordered with black. The median segment has a broad black line, slightly and gradually narrowed towards the apex, and at the sides is a shorter and narrower black line inside the spiracles, which does not reach the apex. The propleuræ are coarsely punctured, except on the lower part and close to the tegulæ, the punctures on the lower part running into reticulations; the oblique furrow on the mesopleuræ is deep, moderately wide, but becoming narrowed towards the apex. Petiole shining, impunctate, depressed and black in the centre at the base. The second to the fifth segments broadly black at the base, the black on the second segment dilated in the middle and extending along the sides to the apex as a narrow line. The ventral segments are narrowly edged with black at the apex. Legs yellow, the femora lined with black above, the hinder coxæ black on the lower side, the middle trochanters blackish. The second cubital cellule is shorter than the third, oblique, shortly petiolated above; the third cubital cellule becomes wider towards the apex; the first recurrent nervure is interstitial, the second received shortly before the middle of the cellule. The base of the fore wing to the transverse basal nervure and the apex to the middle of the cubital cellules suffused with fulvous.

This species bears a great resemblance to a wasp (*Polistes*), which fact is of interest in connexion with their supposed habits.

Trigonalys apicipennis, sp. n.

Nigra, dense fulvo pilosa, abdominis apice late fulvo, tibiis tarsisque posticis testaceis; alis fulvo-hyalinis, apice fumatis. ♀.
Long. 8 millim.

Hab. Mexico, Atoyac in Vera Cruz (*H. H. Smith*).

Antennæ as long as the thorax, the middle thickened, the apical part gradually and sharply narrowed; almost bare, the third and fourth joints testaceous; black at the apex; the third joint distinctly longer than the fourth. Head closely punctured on the front and vertex; densely covered, the mandibles (except the teeth) and clypeus included, with long fulvous hair; the clypeus shining, impunctate. Thorax covered with fulvous hair, closely punctured; the mesonotum almost transverse at the base, depressed in the middle at the base, and with a narrow indistinct furrow down the sides; the scutellum rugosely punctured, thickly covered with long fulvous hair, the sides at the apex with two narrow keels;

the pro- and mesopleuræ strongly punctured, the former excavated in the centre, the latter with a broad shallow oblique furrow in the middle; the metapleuræ with an oblique crenulated depression down the centre, the apex coarsely punctured. Petiole flat above, impunctate, covered with long white hair, the sides above and at the apex rufo-testaceous; the other abdominal segments covered closely with white hair, the apex of the second and third segments broadly, and the other segments entirely, rufo-fulvous; beneath, the petiole and the second segment are rufo-fulvous at the apex. Legs covered with white hair; the fore tibiæ and tarsi in front, the middle tibiæ in the centre in front, the basal joint of the middle tarsi entirely, the hinder tibiæ, except a black line in the centre behind, and the metatarsus, except at the extreme apex, yellowish testaceous. The wing-nervures are fulvous, the stigma black; the first transverse cubital nervure is broadly curved and narrowed towards the second, the second and third nervures are straight, oblique. The second cubital cellule is much narrowed at the top, being there not much more than the distance bounded by the recurrent and the first transverse cubital nervures; the first recurrent nervure is received quite close to the base of the cellule, the second shortly before the middle and is largely bullated at the top, the three transverse cubital nervures being also shortly bullated near the bottom; the tegulæ and the tubercle beneath them are yellowish.

Trigonalys flavonotata, sp. n.

Nigra, thorace flavo-maculato; pedibus flavis, femoribus late nigris; alis hyalinis, antice fumatis. ♂.

Long. 10 millim.

Hab. Mexico, Xucumanatlan in Guerrero, 7000 feet (H. H. Smith).

Antennæ as long as the head, thorax, and petiole, thickened towards the middle; the second joint and the base of the third testaceous. Head shining, impunctate, densely covered with long fuscous hair; the clypeus depressed at the apex; the mandibles covered with long white hair, piceous before the teeth. Thorax densely covered with fuscous hair; the mesonotum with the parapsidal furrows moderately distinct, converging towards the apex; the sides of the pronotum closely obliquely striated, with an impunctate space at the base, the apex with a yellow mark, broad at the tegulæ, narrow in front. The mesonotum rather coarsely punctured;

a yellow elongated line at the base of the furrow and a shorter broader one at the apex; towards the apex are two straight shining lines. Scutellum coarsely rugosely punctured; there are two yellow marks on its base, and at the sides of these is an oblique yellow mark close to the wings; at the sides of the scutellum the mesonotum is shining, impunctate, and marked with oblique keels; at the apex of the scutellum the punctuation runs into reticulations; at the sides of the scutellum there are also short oblique keels reaching from the wings to the apex of the scutellum, and with a short yellow mark near the wings. The median segment stoutly transversely striolated; at the base in the centre are two small yellow marks, and at the apex laterally are two large yellow marks. Mesopleuræ coarsely punctured, the punctures running into reticulations at the apex, densely covered with white hair; the metapleuræ excavated at the base, shining, impunctate, the apical part punctured coarsely, the apex crenulated. Abdomen shining, impunctate; all the segments edged with yellow. The ventral segments without yellow, shining; the first segment at the base crenulated, the apex of the second and third segments projecting into two triangular teeth; there is a smaller projection on the fourth segment. Legs sparsely covered with pale hair; the coxæ pale yellow, the hinder pair black at the base; the trochanters yellow, the front pair marked with black beneath; the four front femora are almost entirely black; the hinder pair black, yellow at the base and apex. The radial nervure is curved and is received shortly before the second transverse cubital nervure; the first transverse cubital nervure is sharply elbowed below the middle, the second slightly oblique, the third straight; the first recurrent nervure is received in the basal fourth of the cellule, the second before the middle; the second and third cubital cellules at the bottom are about equal.

Trigonalys fasciatipennis, sp. n.

Nigra, capite et thorace albo-maculatis, femoribus posterioribus brunneis; alis hyalinis, anticis fumatis.

Long., ♀ fere 10, ♂ 6 millim.

Hab. Mexico, Atoyac in Vera Cruz [♀], Venta de Zopilote in Guerrero [♂] (*H. H. Smith*).

Antennæ slender, reaching to the middle of the abdomen, brownish beneath in the middle; the apex of the scape yellow. Head closely punctured, covered with a short white pubescence; the orbits of the eyes to near the top,

a mark on the edge behind on the level of the top of the eyes, the antennal tubercles, the sides of the clypeus, and the mandibles before the teeth yellow. Thorax above rather strongly punctured; the parapsidal furrows deep, crenulated; the scutellum flat, closely punctured; the median segment rather strongly punctured, the punctures running into reticulations at the base, where there is a narrow shallow longitudinal furrow. The pro- and mesopleuræ closely punctured, the apex of the former almost striolated; the metapleuræ above reticulated, slightly excavated, crenulated. A spot on either side of the base of the mesonotum, two marks on the scutellum, one close to the wings, the postscutellum and two marks on either side of it, two large marks on the sides of the median segment (somewhat oblique and broadest at the apex), the edge of the pronotum, a large mark on the propleura, a large mark incised at the apex, and a small mark over the middle coxæ, and two marks on the metapleuræ, yellow. Abdomen as long as the thorax, shagreened, covered with a close pubescence; the petiole deeply excavated at the base and also at the apex in the middle, shining, black, the apex pale yellow; the other segments marked with pale yellow at the apices. The apex of the petiole beneath and of the second ventral segment yellow, the latter with the yellow dilated in the middle. The fore wings banded with fuscous from base to apex in front, the band broadest near the centre of the cubital cellules; the basal abscissa of the radius is curved and united to the second transverse cubital nervure; the second cubital cellule is longer and narrower than the third; the first recurrent nervure is received close to the first transverse cubital cellule, the second near the apical third of the cellule. The four front trochanters are black, yellow at the apex; the hinder pair and the base of the hind femora yellow.

The male is much smaller (only 6 millim. long); it has the thorax less strongly punctured; the yellow marks on the scutellum are united and longer; the two yellow marks on the median segment are larger and extend to the extreme base and apex, and are not so oblique; there is no mark on the mesopleuræ; the stigma is paler; the legs are darker coloured, wanting the rufous tinge; all the abdominal segments are yellow at the apex, and the mesonotum is not nearly so strongly punctured.

Trigonalys Championi, sp. n.

Trigonalys Championi, Cameron, Biol. Centr.-Am., Hymen. i. t. xx.
fig. 24.

Nigra, ore, coxis, trochanteribus, basi femorum, segmento mediali petiolique albis; alis violaceis.

Long. 11 millim. ♂.

Hab. Guatemala, Panima in Vera Paz (*Champion*).

Antennæ as long as the head, thorax, and petiole united, moderately stout, entirely black, covered with a short pale down; the third joint as long as the fourth. Head densely covered with white hair; the front strongly punctured; the antennal tubercles, the clypeus, and the base of the mandibles yellowish white, the edge of the mandibles and the mandibular teeth black; the apex of the clypeus incurved. Thorax above thickly covered with fuscous hair, coarsely rugosely punctured, the punctures running into reticulations on the median segment; the median segment with the punctures more widely separated and with a wide and deep furrow at the base; the pleuræ densely covered with fuscous hair, the mesopleuræ closely punctured, the propleuræ more strongly punctured and with a pale yellow pear-shaped mark in front; the metapleuræ closely punctured, more strongly in the middle, its apex broadly pale yellow, the part in front of the stigma being black. The petiole is entirely pale lemon-yellow, shining, impunctate, sparsely covered with long white hair; the other abdominal segments are entirely black, strongly punctured, covered with short black pubescence, the apex with the pubescence longer and white; the ventral segments are covered with long soft white hair. Legs covered with white hair. The fore wings are entirely deep violaceous; the hinder pair clear hyaline, with the apex broadly violaceous.

Fam. Proctotrupidæ.

Subfam. BETHYLINÆ.

Epyris orizabæ, sp. n.

Long. 7-8 millim. ♂.

Hab. Mexico, Orizaba (*H. H. Smith and F. D. Godman*).

Very nearly related to *E. rugifrons*, Cam., from the Pacific slope of Guatemala, but smaller, less robust, the head coarsely punctured behind the ocelli (in *E. rugifrons* there is an impunctate space behind them), the middle lobe of the meso-

notum with some large deep punctures, and the head, thorax, and abdomen much less pilose.

Antennæ stout, densely covered with white pubescence, a little longer than the head and thorax united, the third joint, if anything, longer than the fourth. Head covered with long soft pale hair; coarsely punctured all over. Prothorax shorter than the head, coarsely punctured; the apex depressed, very finely punctured. The mesonotum with wide furrows, the lateral lobes coarsely punctured; the median lobe with much fewer punctures, there being very few at the base. The scutellum has some widely separated punctures on the basal half. The median segment has in the centre three central and four shorter lateral longitudinal keels; the apex above is reticulated irregularly, the apex itself being semi-perpendicular and reticulated, the reticulations running into punctures. The propleuræ striolated behind, shining; the mesopleuræ coarsely punctured; the metapleuræ striolated. The abdomen is as long as the thorax, smooth, impunctate; the apical segments bear white hair; the last segment with the apical half pale. The legs are entirely black and covered with white hair. The wings are suffused with a fuscous tint; the costa and stigma are black; the nervures at the base pale fuscous, at the apex they are almost obliterated; the first transverse cubital nervure is very pale, the others and the recurrent nervures are indicated in white, but very indistinctly.

Epyris palliditarsis, sp. n.

Niger, longe albo-hirtus; tarsis posterioribus albis. ♂.
Long. 11 millim.

Hab. Mexico, Teapa in Tabasco (*H. H. Smith*).

Head densely covered with long soft white hair, strongly rugosely punctured, the punctures on the front running into reticulations. Antennæ a little longer than the head and thorax united, distinctly tapering towards the apex, densely covered with short white hair; the third joint slightly longer than the fourth. Thorax shining; the pro- and mesothorax densely covered with long white hair; the central part of the mesonotum with the punctures large and widely separated, especially towards the apex, those on the sides smaller and closer together. Scutellum rather strongly punctured, except in the middle towards the apex. The median segment has the basal half longitudinally striated, the striations widely separated, especially towards the middle, where there is a clear space with only an interrupted longitudinal keel; the

apical part is irregularly transversely striolated, the apex is very slightly obliquely sloped and is finely and closely transversely striated. The mesopleuræ coarsely punctured, except immediately under the wings; the metapleuræ are irregularly reticulated. The abdomen is shining, the four or five apical segments densely covered with long white hair, especially at their apices. The legs are densely covered with long white hair; the two anterior tarsi are entirely black; the posterior tarsi white, black towards the apex. The lower part of the wings and the apical part from the base of the stigma are suffused with fuscous.

Allied to *E. rugifrons* and *E. orizabæ*.

Epyris scutellaris, sp. n.

Niger, capite viridi, scutello rufo; alis hyalinis, fusco-maculatis.
Long. 8 millim.

Hab. Mexico, Tierra Colorada in Guerrero, 2000 feet (H. H. Smith).

The head, except at the oral region, where it is black, metallic green, running into bluish shades on the vertex, thickly covered with white hair, strongly and closely punctured. The mandibles are pale testaceous towards the apex. The antennæ are black, densely covered with white hair; the third joint is distinctly longer than the fourth. The prothorax is, if anything, longer than broad, closely punctured, densely covered with white hair and with a not very distinct furrow down the centre. The mesonotum densely covered with white hair; the central furrows are deep, the lateral furrows narrower and less distinct, and the mesonotum outside them is dull rufous. The scutellum is impunctate, shining, rufous. The sides of the median segment project into stout teeth; at the apex above there is a semicircular area, into which run from the side of the segment a central and a lateral keel; the sides have some irregular keels, the apex is slightly oblique and is transversely striated, with a central longitudinal keel. The abdomen is shorter than the thorax, shining, covered, especially at the sides and beneath, with white hair. The legs are covered with white hair; the trochanters are pale testaceous. The basal and the radial nervures are black, the others pale testaceous; the fuscous cloud extends from the basal nervure to the middle of the radial cellule.

A prominent feature in this distinct species is the stout projecting teeth on the median segment. *E. scutellaris* should be placed near *E. erythropodu*, Cam., from Panama.

Epyris montezuma, sp. n.

Niger, antennis pedibusque testaceis; alis hyalinis, stigmatibus nervisque pallidis. ♀.

Long. fere 4 millim.

Hab. Mexico, Orizaba (*F. D. Godman and H. H. Smith*).

Allied to *E. guatemalensis*, Cam., but easily separated from it by the absence of the furrows on the mesonotum and by the deep transverse depression at the base of the scutellum.

Antennæ stout, as long as the thorax, testaceous, infuscated towards the tip; the scape curved, dilated towards the apex, as long as the following three joints united, these being of nearly equal length. Head shining, faintly punctured, sparsely haired; the mandibles testaceous. The extreme base of the pronotum depressed, testaceous; the rest aciculated and with a few shallow punctures. The mesonotum much shorter than the pronotum, aciculated; in front of the scutellum is a wide, deep, somewhat curved furrow. The median segment is longer than the mesothorax; above finely and closely rugosely punctured, almost transversely striated towards the apex; there is a central keel reaching towards the apex and a shorter lateral one; the apex is almost perpendicular and finely transversely striated. The abdomen is shining, pilose at the apex, the apical segments rufous; the basal segment is gradually dilated towards the apex. Legs testaceous, the femora more or less infuscated. Wings hyaline, the nervures pallid yellow; the cubital and transverse cubital nervures obliterated entirely; the tegulæ are pallid yellow.

[To be continued.]

XXVI.—*A List of Reptiles and Batrachians from the Congo Free State, with Descriptions of Two new Snakes.* By G. A. BOULENGER, F.R.S.

AT the request of the Secretary of the Department of the Interior, Congo Free State, I have undertaken to name a collection of Reptiles and Batrachians formed in the State within the last few years, and which will be exhibited at the International Exhibition to be held this year in Brussels. At the same time I accepted to look over the specimens from the same region which are the property of the Brussels University, where they are being arranged by the Curator of the Collection, my friend M. L. De Pauw.

I give a list of the species of which I have identified examples, with an indication of the localities. The latter are thirteen in number, viz. :—

A. West Africa.

1. Zambi-Banana, mouth of the Congo.
2. Zambi, Lower Congo.
3. Bongo-Congo, Lower Congo.
4. Boma.
5. Leopoldville.
6. Stanley Pool.

B. Central Africa south of the Equator.

7. Kuango River.
8. Kassai River.
9. Chuapa River.
10. Lomami River.
11. Nyangwe, Lualaba River.

C. Central Africa north of the Equator.

12. Aruwimi.
13. Zongo, Ubangi Rapids.

REPTILIA.

EMYDOSAURIA.

1. *Crocodilus niloticus*, Laur.—Kuango.

LACERTILIA.

2. *Hemidactylus mabouia*, Mor.—Zambi-Banana; Nyangwe.
3. *Zonurus cordylus*, L.—Aruwimi.
First record north of Angola.
4. *Varanus niloticus*, L.—Kassai.
5. *Monopeltis Guentheri*, Blgr.—Kuango.
6. *Ichnotropis capensis*, Smith.—Kuango.
First record north of Angola.
7. *Mabuia maculilabris*, Gray.—Kassai.
8. *Lygosoma Fernandi*, Burt.—Nyangwe.
First record south of the Gaboon.
9. *Ablepharus cabindæ*, Bocage.—Bongo-Congo.
10. *Feylinia Currei*, Gray.—Zambi.

RHIPTOGLOSSA.

11. *Chamaeleon gracilis*, Hallow.—Stanley Pool.
12. *Chamaeleon dilepis*, Leach.—Bongo-Congo.

OPHIDIA.

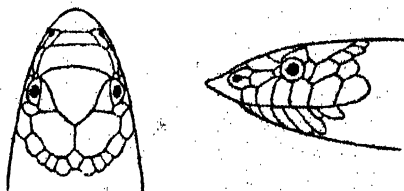
13. *Typhlops punctatus*, Leach.—Boma; Zongo.
14. *Python sebae*, Gm.—Zongo.
15. *Tropidonotus olivaceus*, Ptrs.—Zambi-Banana; Zambi; Boma; Kassai.
16. *Bothrophthalmus lineatus*, Ptrs.—Nyangwe; Kuango; Kassai.

Black, with five yellow or red longitudinal lines, which are narrower than the interspaces.

17. *Boodon lineatus*, D. & B.—Zambi; Kassai; Aruwimi; Zongo.
 18. *Lycophidium capense*, Smith.—Kuango; Lomami.
 19. *Chlorophis heterolepidotus*, Gthr.—Zambi.
 20. *Chlorophis irregularis*, Leach. — Zambi; Nyangwe; Zongo.
 21. *Philothamnus semivariatus*, Smith.—Kassai.
 22. *Philothamnus dorsalis*, Bocage.—Zambi-Banana; Zambi.
- One of the specimens is melanotic:—Uniform black, except the snout, which is of a pale brown, and the throat, which is white. Another has dark brown bars across the neck.
23. *Gastropsys smaragdina*, Schl.—Kassai.
 24. *Hapsidophrys lineata*, Fisch.—Kassai.
 25. *Thrasops flavigularis*, Hallow.—Kuango.

26. *Prosymna Bocagii*, sp. n.

Snout obtusely pointed, very prominent, and slightly turned up at the end. Rostral very large, with angular horizontal



edge; a single internasal and a single prefrontal; frontal large, more than half the width of the head, a little longer

than the parietals, its antero-lateral angles reaching the eyes; loreal longer than deep; a very small præocular; præfrontal entering the eye; one postocular; temporals 1 + 2; six upper labials, third and fourth entering the eye; only one pair of well-developed chin-shields. Scales smooth, in 15 rows. Ventrals 167; anal entire; subcaudals 19. Blackish brown above and beneath, the ventrals and subcaudals edged with pale brown.

Total length 340 millim.; tail 28.

A single female specimen from Zongo, Ubangi Rapids.

This species, which I have the pleasure of naming in honour of Prof. Barboza du Bocage, to whom we are indebted for much of our knowledge of the reptiles of West Africa, is closely allied to *P. ambigua*, from which it differs in the more prominent, slightly turned up snout, the minute præocular, which allows the præfrontal to border the eye, and the single postocular.

27. *Scaphiophis albopunctatus*, Ptrs.—Kuango; Kassai.

Two young specimens. 25 or 27 scales across the neck, 21 across the middle of the body; ventrals 202, 198; subcaudals 55, 51.

28. *Grayia Smythii*, Leach.—Aruwimi.

29. *Dasypteltis scabra*, L.—Zambi; Kassai; Zongo.

Sc. 21-23; V. 199-232; C. 65-81. Some specimens are uniform pale brown; others have the dark markings more or less distinct, but always small.

30. *Leptodira hitambœia*, Laur.—Zambi; Bongo-Congo; Boma; Kuango; Lomami; Zongo.

31. *Dromophis lineatus*, D. & B.—Chuapa.

First record south of the Equator.

32. *Psammophis sibilans*, L.—Zambi; Boma.

33. *Thelotornis Kirtlandii*, Hallow.—Kassai.

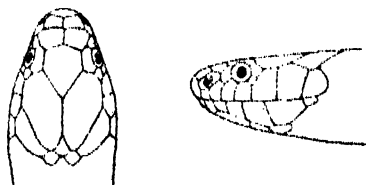
34. *Xenocalamus Mechovii*, Ptrs.—Kuango.

The specimen measures 520 millim.; tail 55. Two minute postoculars. V. 227; C. 34.

35. *Aparallactus ubangensis*, sp. n.

Diameter of eye greater than its distance from the oral border. Rostral broader than deep, just visible from above; internasals shorter than the præfrontals; frontal a little longer than broad, longer than its distance from the end of the snout, shorter than the parietals; nasal divided, in contact

with the præocular; one postocular; no anterior temporal; seven upper labials, third and fourth entering the eye, fifth and sixth largest and in contact with the parietal; first lower



labial in contact with its fellow behind the symphysial; anterior chin-shields larger than the posterior and in contact with four lower labials. Scales in 15 rows. Ventrals 163; anal entire; subcaudals 38. Dark brown above, with a yellow nuchal collar; orange beneath, with a few brown dots scattered on the posterior part of the belly; subcaudals dark brown, with orange posterior border.

Total length 390 millim.; tail 55.

A single female specimen from Zongo, Ubangi Rapids.

36. *Elaeophis Guentheri*, Bocage.—Kuango.

37. *Naia melanoleuca*, Hallow.—Zongo. ♀

38. *Naia nigricollis*, Reinh.—Stanley Pool; Kuango.

39. *Dendraspis Jamesonii*, Traill.—Zambi-Banana; Boma.

40. *Dendraspis angusticeps*, Smith.—Boma.

41. *Causus rhombeatus*, Licht.—Zambi-Banana; Zambi; Boma; Stanley Pool; Kuango; Kassai; Zongo.

42. *Bitis arietans*, Merr.—Leopoldville.

43. *Atheris squamiger*, Hallow.—Stanley Pool; Zongo.

Two specimens, with 7 or 8 keeled scales across the interocular region. The specimen from Stanley Pool is uniform bright yellow, with a single series of scales between the eye and the labials, 21 series of scales, 143 ventrals, and 52 subcaudals; that from Zongo is dark green, with small yellow spots; one series of suboculars on the right side, two series (one of which is incomplete) on the left side; 23 series of scales, 163 ventrals, and 56 subcaudals.

44. *Atractaspis irregularis*, Reinh.—Zambi.

Sc. 27; V. 229; C. 25 pairs.

BATRACHIA.

1. *Rappia tristis*, Bocage.—Zambi.
Known from a single specimen from Angola.
2. *Rappia marmorata*, Rapp.—Zambi.
3. *Bufo regularis*, Reuss.—Zambi.

I seize this opportunity to point out that the three species recently described by Mocquard (C. R. Congr. Intern. Zool. Leyde, pp. 232-234) from the Upper Ubangi in the French Congo are not new.

Mabuia Viancini, Mocq., = *M. Buettneri*, Matschie; *Rana oubanghiensis*, Mocq., = *R. galamensis*, D. & B.; and, as recognized by the author himself, *Ninia yakomæ*, Mocq., = *N. Goldii*, Blgr.

XXVII.—Description of a new Snake from Usambara, German East Africa. By G. A. BOULENGER, F.R.S.

Leptodira Werneri.

Body feebly compressed. Rostral once and two thirds as broad as deep, scarcely visible from above; internasals much shorter than the præfrontals; frontal once and a half as long as broad, longer than its distance from the end of the snout, shorter than the parietals; loreal deeper than long; one præocular, not reaching the frontal; two or three postoculars; temporals 1+2; eight upper labials, third, fourth, and fifth entering the eye; four lower labials in contact with the anterior chin-shields, which are a little longer than the posterior. Scales in 19 rows. Ventrals 225; anal entire; subcaudals 101. Pale grey-brown above, uniform on the head and on the anterior part of the body, the rest of the body and the tail with darker spots more or less confluent into closely-set cross-bands; upper lip yellowish white; ventrals yellowish white, mostly edged with dark brown on the sides; subcaudals brown.

Total length 370 millim.; tail 85.

A single specimen, presented to the British Museum by Dr. F. Werner.

XXVIII.—*Description of a new Species of the Genus Pœcilopsaltria belonging to the Family Cicadidæ.* By W. L. DISTANT.

HERR ANTON HANDLIRSCH having lately submitted to me for determination the Cicadidæ from Africa and Madagascar contained in the "Naturhistorisches Hofmuseum" of Vienna, I have found the following species from Madagascar requires description and to be added to the nomenclature.

This museum has acquired the collection of the late Dr. Signoret, which includes many of Stål's types and determinations. It must be remembered, however, that to many of these specimens are attached MS. names; for my late friend Dr. Signoret combined an enthusiasm for his study beyond the time he could devote to it—which was not inconsiderable—with the result that many species which he decided were undescribed had MS. names affixed in his collection, but received no publication at the time, for he preferred writing on a group at some subsequent period.

Pœcilopsaltria Handlirschi, sp. n.

Body above castaneous. Head with a triangular central mark to front, lateral transverse striæ to face, area of the ocelli (from which emerge two fasciæ, of which the first reaches the anterior lateral margin and the second is recurved to eyes) black. Pronotum with the anterior margin, two central lineate fasciæ, and the incisures black. Mesonotum with four obconical spots starting from anterior margin, of which the two central are smallest, and between the apices of which is a central triangular spot, and the anterior margins of the cruciform elevation black. Abdomen with the lateral areas of the three basal and the whole of the remaining segments black. Body beneath and legs pale castaneous.

Tegmina brownish ochraceous, the apical areas and margin more or less purplish brown and mottled with greyish; a distinct greyish-white submarginal spot in upper ulnar area. Wings brownish ochraceous, with rather more than basal third darkly infuscated.

The rostrum reaches the posterior coxæ.

Long., excl. tegm., ♀ 39 millim.; exp. tegm. 104 millim.

Hab. Madagascar (*Schneider*, 1880).

The description is based on one female specimen, and the type is in the Vienna Museum. By the internal fuscous area to the wings it is allied to *P. Brancsiki*, Dist., but the remaining totally different coloration will alone serve to distinguish it from that species.

XXIX.—*Descriptions of some new Oriental Opiliones recently received by the British Museum.* By R. I. Pocock.

Suborder **PLAGIOSTETHI**, Simon.

Family **Phalangiidae**.

Genus **GAGRELLA**, Stoliczka.

Gagrella insculpta, sp. n.

Closely allied to *G. scrobiculata*, Thorell (Ann. Mus. Genov. xxx. p. 117), from Borneo, but apparently differing in the following particulars:—The colour of the trunk is black, but there are some bright yellow spots near the sides of the carapace, one on each side of the tergal shield of the abdomen, and one on the anterior surface of the distal end of the fourth coxa (these spots do not appear to be present in *scrobiculata*). Mandibles yellow, spotted with brown in front in one specimen, but not nigro-piceous as in *scrobiculata*.

Legs black; tarsi testaceous; the adjacent extremities of the tibiae and protarsi bright yellow. Sternal area of abdomen with a wide flavous stripe on each side of it.

The sculpturing of the trunk appears to resemble that of *scrobiculata*, except that the free abdominal terga are exceedingly finely punctulate and not very finely granular.

The supramandibular processes are not acuminate and narrow, but stout, with the apex digitate, each digitiform process armed apically with small tubercles; immediately behind them on the carapace there is a low smooth eminence.

Length of trunk 8.5 millim., width 5.

Loc. Baram, Borneo. Several specimens obtained by Mr. Charles Hose.

Suborder **MECOSTETHI**, Simon.

Fam. **Oncopodidae**, Thor.

Genus **PELITNUS**, Thor.

(Ann. Mus. Genov. xxx. p. 757 (1890).)

Pelitnus annulipes, sp. n.

Colour of upperside of trunk and of lower side of abdomen a deep brownish black; coxæ fusco-ferruginous; legs brunneo-fuscous, with the tarsi, trochanters, and apices of femora, patellæ, and tibiae orange-yellow.

Trunk smooth though not polished, piriform; width of abdomen a little more than two thirds length of trunk (5:7). *Carapace* convex transversely, about twice as wide as long, widely and transversely truncate anteriorly, its anterior lateral angles rounded, its sides nearly parallel, the interocular area elevated into an erect triangularly spiniform tooth, at the base of which on each side the eye is situated; the area in front of the tubercle nearly vertical, that behind it horizontal in the middle, strongly sloped away at the sides, where there is a distinct tubercle, and just above and behind it a deep pit leading apparently into a tunnel which passes beneath a kind of bridge formed by the union of the middle of the dorsal surface of the carapace and the corresponding area of the first segment of the abdomen; the middle of the upper surface of this bridge marked with a deep pit, which evidently corresponds to the shallow but wide sulcus which longitudinally divides the anterior abdominal tergal ridges, but dies out on the posterior ones; these ridges are nine in number, counting that in the first that forms the hinder half of the bridge; none of the terga are free and all the sterna are similarly fused, being represented by transverse ridges, and the original sutures between them by grooves.

Mandibles only moderately strong, the basal segment distally expanded and terminating above in a bluntly rounded prominence, its upper edge longitudinally straight, the forceps weak, the digits scarcely sinuate; when extended these appendages reach only to the end of the femur of the palp.

Palpi reaching just past the tibia of the first leg, bearing a single cylindrical process on the under surface of the maxilla, trochanter, and base of femur.

Legs longish; the coxæ sending out in front and behind a buttress to support the narrowed base of the trochanter; this buttress on the posterior face of the second coxa is double, and bears, in addition, a tubercle, while on the upper surface of the segment there is a pair of large tubercles beneath the edge of the carapace, and the inner angle of this segment is armed with a forwardly directed angular tooth projecting partially beneath the coxa of the first leg, upon which close to the lip-like maxillary plate there is a low rounded prominence; the rest of the coxæ and of the segments of the legs are without special processes. The coxo-sternal area between the genital plate and the mouth-parts longitudinally depressed and forming a deep wide channel.

Genital plate triangularly heart-shaped, about as wide at the base as it is long.

Measurements in millimetres.—Total length of trunk 7;

width of abdomen 5, of carapace 2·5; length of first leg (excluding coxa) 9·5, of second 15, of third 10·5, of fourth 15.

Loc. Baram, Borneo. One specimen obtained by Mr. C. Hose.

The only other known species of this genus is *P. armillatus*, Thor. (*loc. cit.*), from Ajer Mantjur in Sumatra, which is based upon a small example 2 millim. long and evidently not adult. But it certainly differs from the species here described in having the abdomen as wide as the trunk is long and more than half the length of the fourth leg. The palpi, moreover, are said to be unarmed, no processes being described as present upon the lower side of its basal segments.

So far as I can judge of the characters of *Gnomulus* from the description of the two known species published by Dr. Thorell—namely *G. rostratus* (Ann. Mus. Genov. xxx. p. 378), from Pinang, and *G. sumatranus* (*loc. cit.* p. 759), from Mount Singalang—the genus *Pelitus* only differs from it in possessing a triangularly spiniform erect interocular tubercle. The two differ from the following genus *Oncopus* in having the anterior two pairs of tarsi two-jointed and the posterior two pairs three-jointed. In *Oncopus* all the tarsi are composed of a single segment.

Genus ONCOPUS, Thor.

(Ann. Mus. Genov. ix. p. 134 (1876).)

Oncopus Hosei, sp. n.

Nearly allied to *O. Doriae*, Thorell, from Mus. Genov. ix. p. 138, 1876–77), but differs in the following particulars:—

The body is narrower as compared with width of the abdominal region being considered two thirds the length of the dorsal surface.

On the abdomen there are only *two* distinct pairs of both of which appear to be relatively smaller and closer together than those in *O. Doriae*. The third tubercles from the end depicted in the drawing of *O.* only just visible in *O. Hosei*.

The genital plate is distinctly longer than wide, and from the inner angle of the coxa of the legs of the third pair a slender spiniform process runs forward, underlying the maxillary process of the coxa of the legs of the second pair.

Palpi extending nearly to the apex of the protarsus of the first legs; femur has no processes below (in *Doriae* there are said to be two processes, one at the base and the other in the

distal half), and I can see nothing of the nature of a blunt bifid spine or process arising from the lower side of the maxillæ, there being at most a low and undivided prominence here. Moreover, on the coxæ of the first leg there are distinctly *four* processes visible below, one a largish conical eminence situated in the middle of its lower surface, a second small blunt tooth-like one on its anterior surface just below

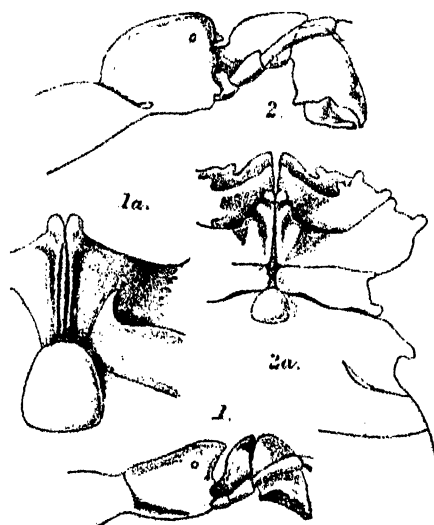


Fig. 1.—*Oncopus Hosei*; head and mandible.
 Fig. 1 a.—Ditto; coxæ of second and third legs.
 each. 2.—*Oncopus alticeps*; head and mandible.
 2 a.—Ditto; coxal area of carapace.

r, ant and the other two on its distal margin. All the
 ongi are without tubercles, but there is a distinct
 at the base of the upperside of the femur of the
 g.
 rements in millimetres.—Total length of trunk 9·3;
 of carapace 3, width 3; width of abdomen 5; length
 leg (excluding coxa) 9, of second 13, of third 9, of
 3·5.

Loc. Baram, Borneo. A single specimen obtained by
 Mr. C. Hose.

From the other known species of *Oncopus*, namely *O. Few*,
 Thorell (Ann. Mus. Genov. xxx. p. 375, 1890), from Pinang,
 and *O. truncatus*, id. (tom. cit. p. 764), from Singapore, this
 new species seems to differ in the same respects as those
 pointed out by Thorell as distinctive of *O. Doria*.

Oncopus alticeps, sp. n.

Colour deep blackish brown, carapace and mandibles paler; extremities of the leg-segments and the entire tarsus pale.

Carapace very high, abruptly elevated behind at its junction with the abdomen, strongly rounded from side to side, without any broad elevated interocular prominence such as is seen in *O. Hosei*.

Mandibles very strong, the basal segment suddenly raised at the base and projecting forwards to a point nearly on a level with the tip of the femur of the palp, which curves round it, armed externally below with a spiniform tooth, only a small portion of the second segment visible from above.

The *palp* with the tarsus stouter than in *Hosei*, the claw thick, short, tarsiform, and forming a small pincer with a short process from the apex of the tarsus.

Legs as in *Hosei*; the coxæ of the second, however, on each side of the middle line are thickened and raised into a warty eminence, which projects forwards and terminates in a black bilobed maxillary process, and there are no forwardly-directed processes on the inner extremities of the coxæ of the third legs.

Genital plate broader as compared with its length than in *Hosei*.

Abdomen as in *Hosei*, but as broad as long, with three pairs of distinct tubercles, the posterior being much the longest; the five smooth transverse ridges on the lower surface not so thick as in *Hosei*.

Measurements in millimetres.—Total length of trunk 9.5; width of abdomen 6, length up to the lateral pit 7, to posterior border of head 6.

Loc. Pinang Hill (2260 feet alt.). A single specimen obtained by Mr. Stanley Flower, of the Royal Museum, Bangkok, Siam.

The annexed table will serve to show the distinctive characters of this and the other species of the genus known to me :—

- a. The carapace very high and convex, its posterior portion abruptly elevated above the level of the abdomen; the basal segment of the mandible very long, reaching nearly to the extremity of the femur of the palp, only a small portion of the second segment visible from above; maxillary process of second leg very large and thick *alticeps*, sp. n.
- b. Carapace low, posteriorly but little or no higher than the adjacent area of the abdomen; mandibles

much smaller, almost as much of the second segment visible from above as of the first, the latter not extending beyond the middle of the femur of palp; maxillary process of second leg relatively small.

- a*¹. The anterior portion of the carapace produced forwards and upwards into a blunt interocular beak; the last tergite of the abdomen with two large tubercles; coxa of third leg furnished at the base with a forwardly-directed spiniform process *Hosei*, sp. n.
- b*¹. The anterior portion of the carapace low, with at most a small prominence; last tergite of abdomen without tubercles; coxa of third leg without basal spiniform process *truncatus*, Thor.

The type of the genus, *O. Doriae*, and the remaining species, *O. Fææ*, which seem to be closely allied, will fall, apparently, alongside of *Hosei* under section *a*¹ of the above table; but there is no mention in the description of either of them of the presence of a spiniform process on the coxa of the third leg. *O. Fææ* is said to differ from *O. Doriae* in having the dorsal part of the abdominal region longer, namely, more than three times as long as the carapace instead of two and a half times, the femur of the palp having only one tubercle below at the base instead of two, &c. In *Hosei* there is no tubercle in this position.

Of the Singapore species *O. truncatus* the British Museum has from time to time received a number of specimens from Mr. H. N. Ridley.

Suborder ANEPIGNATHI, Thorell.

(Ann. Mus. Genov. 1882, p. 22.)

Family SIRONIDÆ, Simon.

Genus PETTALUS, Thor.

(Ann. Mus. Genov. viii. p. 469 (1876).)

This genus was founded by Thorell for the reception of the species from Ceylon described by Cambridge as *Cyphophthalmus cimiciformis* (Ann. & Mag. Nat. Hist. (4) xvi. pp. 388-389, pl. xiii. fig. 3, 1875). The characters upon which it was based and distinguished from *Siro* (*Cyphophthalmus*) were the alleged presence of a fourth segment on the mandibles and the bifurcation of the last dorsal plate of the abdomen.

In the species of this genus, however, that I have seen there is no fourth segment on the mandible and the bifurcation of the abdominal segment may be almost absent, varying within the limits of the same species. Apart from this

character, however, the genus may be distinguished from *Siro* by having the tarsi composed of a single segment, whereas in *Siro* the proximal end of the tarsus is, according to Simon ('Arachnides de France,' vii. p. 144, pl. xxii. figs. 10-13), separated off. Also in *Siro* the eyes appear to be marginal as in *Stylocellus*, whereas in *Pettalus* the two tubercles are nearly as far from the margins as they are from each other. *Miopsalis*, Thor. (Ann. Mus. Genov. xxx. p. 381, 1890), will probably prove synonymous with *Pettalus*.

Some facts connected with the structure of the stomotheca and sternal surface of the carapace are perhaps worth recording. The *maxillæ* lie vertically between the coxæ of the first pair of legs, their lip-like apices just appearing at the hinder end of the stomotheca; these lips, which are defined by a suture, are the maxillary lobes. The posterior ends of the first coxæ close the stomotheca behind, since they just meet in the middle line; and lying alongside of their inner edges is a narrow sclerite, ending below in a lip-like piece, which appears to represent the maxillary lobe of this coxa. The coxæ of the second pair end in long processes, which meet in the middle line behind those of the first and separate them from a large pentagonal plate lying between the coxæ of the third and fourth appendages. This plate is furnished with a pair of conical elevations, and in the middle line behind them there is a small crescentic genital aperture.

Pettalus brevicauda, sp. n.

Colour (in alcohol) a uniform yellowish brown.

Body oval, short, not much longer than broad, broadest at the posterior border of the carapace, covered above and below with somewhat coarse granulation.

Carapace with its posterior border mesially convex above, lightly concave at the side; ocular tubercles conical, broad and circular at the base; the margin just above the base of the mandibles prominent. Upper surface of abdomen composed of eight distinct plates, separated by grooves, the grooves scarcely granular, the granules along the anterior and posterior edge of the plates coarser than the rest; the last segment much smoother, marked with a deep longitudinal groove and a deep posterior notch; beneath the bilobed plate, and separating it from the circular anal plate, there is a crescentic tergite, the sternite of which is a narrow plate immediately in front of the anal sclerite. Rim of stigmata forming nearly a complete circle.

Appendages.—*Mandibles* with basal segment cylindrical, Ann. & Mag. N. Hist. Ser. 6. Vol. xix, 21

about four times as long as wide, with a transverse crest at its proximal end above and a strong prominence below, granular throughout and about two thirds the length of the second segment, which is smooth and polished. *Palpi* about equal to the mandibles in length, the tibia one third longer than the tarsus; finely granular above and below; the tibiae longer than the patellae, the protarsi nearly half the length of the tarsi; lower surface of first tarsus distally finely scopulate, much swollen in the middle of its length; tarsus of fourth with a rounded tubercular knob on its posterior (inner) surface at the proximal end, and from this a short tooth-like process projects forwards and upwards.

Length 3.8 millim., width 2.5.

Loc. Punduloya, Ceylon (*E. E. Green*).

Differs from *Pettalus cimiciformis* (Cambridge) in its relatively weakly lobate "tail" and much smaller process on the fourth tarsus. A second smaller specimen, obtained by Mr. Green, has no process on the fourth tarsus, and the last tergite scarcely lobate and not grooved. This specimen is probably either young or a different sex from the type.

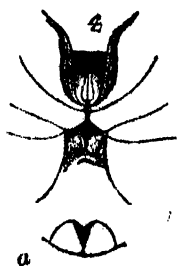
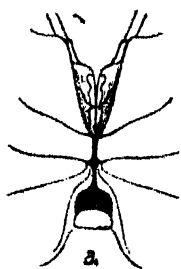


Fig. 3.—Coxal area of *Stylocellus limotus*.

Fig. 4.—Ditto of *Pettalus brevicauda*.

Fig. 4 a.—Last tergite of *Pettalus brevicauda*.

Genus STYLOCELLUS, Westw.

Stylocellus, Westw. Thesaurus Ent. Oxon. p. 200, pl. xxxvii. fig. 7 (1874).

Leptopsalis, Thor. Ann. Mus. Genov. xviii. p. 23 (1883).

Judging from the species of this genus that I have had an opportunity to examine, the sternal region of the cephalothorax differs in some important and puzzling particulars from the same area in *Pettalus*. The stomotheca is closed behind by the coxæ of the second pair of legs, which, like those of the first pair, have their inner edges strongly elevated. Moreover, the coxæ of the legs of the fourth pair apparently meet each other in the middle line in front of the large transversely reniform genital aperture, and separate it from a small sternal plate, which is wedged in between the coxæ and second pair of legs. The genital aperture is bounded

behind by a semilunar genital plate, which is fused behind with the first abdominal sternite. I say that the coxæ apparently meet each other in front of the genital aperture, because there appears to be no distinct suture, only integumental folds, between their main portions and their inwardly-directed processes. From a comparison of the figures of the coxal areas of *S. lionotus* and *Pettalus brachyurus* it seems that the maxillary lobes of the legs of the first pair in the former are not represented in the latter, where the maxillary lobes of the palpus appear to be the only organs that can be called lips, and that the pentagonal plate with its two elevations that lies in *Pettalus* between the coxæ of the second, third, and fourth pairs of legs and before the genital aperture is represented in *Stylocellus* by the minute sternal plate and by the inwardly-directed pregenital coxal lobes of the fourth legs. But whether in the case of the *Stylocellus* the coxæ have grown inwards and obliterated the sternal area of *Pettalus*, or whether they have merely fused with it, I cannot at present say. In *Siro* (cf. Thorell, Ann. Mus. Genov. xviii. 1882, p. 24, in note) there is a largish sternal plate lying longitudinally between the coxæ of the first, second, and third pairs of legs at the sides, the genital aperture behind, and the apex of the stomotheca in front. *Siro*, therefore, is in some respects intermediate between *Pettalus* and *Stylocellus*.

Stylocellus lionotus, sp. n.

Colour of trunk black, of appendages very deep ferruginous.

Upper surface of *trunk* and lower surface of abdomen smooth; coxæ mesially granular below, the first more thickly so than the others.

Body about twice as long as wide.

The sessile *eyes* situated some distance—i. e. by a space that slightly exceeds their diameter—in front of the ocular tubercle.

Mandibles nearly as long as the palpi; basal segment thickly granular below and bearing two tubercles, one at the base, the other in the middle of their length, towards the outside of the lower surface; the second segment granular above at the base, smooth and polished elsewhere.

The legs and other organs apparently as in *S. sumatranus*, Westw. (Thes. Ent. Oxon. p. 200, 1874).

Measurements in millimetres.—Total length 6; width 3; height 2.2; length of first leg 9, of second 6.3, of third 6.5, of fourth 8.8.

Loc. Sandakan, N. Borneo. A single specimen obtained by Mr. Douglas Cator.

This species may be at once recognized from *S. sumatranus* (= *S. Biccarii*, Thorell, Ann. Mus. Genov. xviii. p. 25, 1882) from Sumatra and from *S. javanus* (Thorell, *loc. cit.* p. 30) from Java by having the upper surface of the trunk smooth and not densely granular.

XXX.—*A Contribution to the Osteology of the Mesozoic Amioid Fishes Caturus and Osteorachis.* By A. SMITH WOODWARD, F.L.S.

[Plates VIII.-XI.]

THE well-known Leeds Collection from the Oxford Clay of Peterborough has already furnished many important illustrations of the osteology of the Mesozoic fishes. Several more examples, however, still remain to be utilized, and the present contribution to our knowledge of the early Amioids is chiefly based on a fine series of new specimens of *Caturus* and one of *Osteorachis* in this collection. The description of these is followed by a brief note on a unique example of the Liassic *Osteorachis macrocephalus*, which has hitherto been imperfectly known, but can now be elucidated with greater precision. The whole series of observations shows more clearly than ever how extraordinarily similar are certain Mesozoic rhombic-scaled notochordal genera to the existing *Amia*, even in some of the minute features of osteology.

I.—*Caturus*, SP. IND., FROM THE OXFORD CLAY OF NORTHAMPTONSHIRE AND WILTSHIRE.

There is still so much uncertainty as to the distinction of the various species of *Caturus* known even by whole skeletons that it seems inadvisable at present to give any specific names to the comparatively fragmentary examples of this genus from the English Oxford Clay. Their great interest consists not in their precise systematic relationships, but in their naturally dissected condition, which adds so much to our knowledge of the osteology of the fish. It must suffice to remark that most of the specimens belong to a species closely related to, if not identical with, the typical *Caturus furcatus* of the Bavarian Lithographic Stone; while some have comparatively larger and fewer teeth. All these fossils have now been acquired

by the British Museum, and the numbers in brackets always refer to the Register of the Department of Geology.

Cranium.

The chondrocranium exhibits extensive ossifications, but was not sufficiently resistant to withstand complete collapse in the soft clay. The basioccipital is deeply excavated on its posterior face by a conical fossa for the notochord, and the inferior aspect of the bone (no. P. 6901) is marked by a longitudinal groove, though this is not covered by the parasphenoid and there is apparently no basicranial canal. There are robust ossifications in the postfrontal and prefrontal (lateral ethmoidal) regions, but cartilage must have persisted in the mesethmoid, which can only have been small. In the lateral wall of the cranium, immediately in front of the postfrontal, there appears a very large ossification, longer than deep, which is probably to be identified with the alisphenoid (no. P. 6906); a smaller, nearly quadrate ossification adjoins this behind, and seems to correspond with the pro-otic of *Amia* (seen in same specimen); and a third bone, occurring still further back, quite at the angle of the occiput (seen in no. P. 6901), agrees well with the opisthotic of the same genus. The latter element is shown to be pierced by a large oval foramen, evidently for the exit of the vagus nerve. A great parasphenoid sheaths most of the base of the cranium, forked posteriorly and not quite reaching the occiput, comparatively broad in advance of the basipterygoid processes, and provided in this region with an elongated lenticular patch of very minute teeth. Each basipterygoid process was evidently much elongated, reaching the postfrontal above. The parasphenoid extends as far forwards as the prefrontal region, there expanding a little and meeting the pair of large vomers. These two bones meet throughout their length, but are not fused in the median line, and each is about three times as long as broad, bearing a few teeth only at its anterior end. The bases of about four of these vomerine teeth are shown in no. P. 6901. The membrane-bones of the cranial roof form a continuous flattened shield, and in large individuals its principal elements sometimes appear to be fused together. The occipital border is straight (Pl. VIII. fig. 1, *occ.*), formed, as usual, by the parietals and squamosals. The parietals (*pa.*) are shown, in nos. 29049, P. 6908 c, to be relatively small, with the wavy suture between them not quite mesially placed, and each sends forwards at its outer margin a long pointed process inter-

digitating with the frontal (seen also in no. P. 6904). The squamosals (*sq.*), though considerably crushed and fractured in the specimen figured, are observed to be much larger than the parietals and extend further forwards. The frontals (*fr.*) are relatively enormous, uniting in an irregular, often interdigitating mesial suture, the outer surface especially rugose in their anterior half, and irregularly marked with rows of pittings which appear to be connected with the sensory canal-system. It is not quite clear whether the ossified postfrontal appears behind, but the prefrontal is exposed in front (Pl. VIII. fig. 2, *pr.f.*), and between these two elements the frontal is bordered by an irregular series of supraorbital plates (Pl. VIII. figs. 1, 2, *sp.o.*), which are continued extensively down upon the cheek as a patch of antero-posteriorly elongated tesseræ (Pl. VIII. fig. 2, *t.*). This arrangement can also be seen in the typical species, *Caturus fuscatus*, from the Bavarian Lithographic Stone (*e.g.* specimen in Brit. Mus., no. P. 908). The nasal bones (Pl. VIII. figs. 1, 2, *na.*, and Pl. IX. figs. 4, 4 *a*) are small, antero-posteriorly elongated, externally tuberculated, and exhibit the usual little lateral process in the anterior half of their outer margin. One specimen (Pl. VIII. fig. 2) suggests that a very small, transversely elongated, bilaterally symmetrical membrane-bone (*x*) also covered the rostral end of the mesethmoid; but this little element is crushed and fractured.

Facial Bones, Jaws, and Hyoid Apparatus.

The cheek is completely covered with thin plates. Immediately in front of the preoperculum are two very large plates of the suborbital (postorbital) series (Pl. VIII. fig. 3, *s.o.*). Two circumorbitals (*c.o.*), the lower broad and the upper narrow, separate these from the orbit, and there is a small series beneath the eye. There is also at least one antorbital plate (Pl. VIII. fig. 3, *a.o.*). The supraorbitals have already been described, and it only remains to add that portions of an ossified sclerotic can often be observed within the cavity of the orbit (Pl. VIII. fig. 3, *scl.*). The hyomandibular (Pl. IX. fig. 1, *hm.*) is large, much laterally compressed and expanded, with a considerable process (*p.*) for the support of the operculum. The quadrate (Pl. IX. fig. 1, *qu.*) is triangular, meeting the front half of the lower margin of the hyomandibular, and doubtless bordered behind by an ossified symplectic, which has not yet been seen. The articular head of the quadrate is especially robust, with a concave facette for the articulation of the mandible. The

pterygoid bones are too imperfect for description; but the entopterygoid is clearly thin, expanded, and laminar, with fine granulations on its oral face (Pl. IX. fig. 1 *a*, *enpt.*). Another stouter bone, which is deepened in front and bears a series of large teeth on its outer inferior margin, may be the ectopterygoid (Pl. IX. fig. 1, *ecpt.*). The palatine on its inner face appears as a small lamina of bone below the entopterygoid, and on its oral margin, which is apposed to the maxilla, there is a single series of large teeth (Pl. VIII. fig. 4 *a*, *pl.*); but viewed from without (Pl. VIII. fig. 4, *pl.*) this element is shown to be in reality of robust proportions, interposed as usual between the maxilla and prefrontal. The maxilla (Pl. VIII. figs. 3, 4, *mx.*) is much elongated, somewhat deepened behind, thickened in front, and bearing a long inwardly and anteriorly directed process immediately in advance of its palatine articulation. Its oral border forms an irregular concave arch, and bears a single series of teeth, which are smallest behind; the hinder portion of its upper border exhibits a facette (Pl. VIII. fig. 4, *f.*), which is overlapped by an elongated supramaxillary plate (Pl. VIII. fig. 3, *s.mx.*). The premaxilla (Pl. VIII. fig. 3, *pmx.*) exhibits an extended oral border, with a series of teeth larger than those of the maxilla; the nature and limits of its ascending process cannot be satisfactorily observed. The mandible (Pl. VIII. fig. 3; Pl. IX. figs. 1, 1 *a*) is very narrow at the symphysis, has a nearly straight inferior border, and gradually rises into a high coronoid region near its hinder end; it comprises four, perhaps five, distinct elements. The long dentary (Pl. VIII. fig. 3; Pl. IX. figs. 1, 1 *a*, *d*) occupies the greater portion of the outer aspect, meets its fellow of the opposite side at the symphysis, rises behind into the coronoid, and bears a single series of relatively large teeth. The splenial (Pl. IX. fig. 1 *a*, *spl.*) extends about as far as the dentary on the inner side of the ramus, and is much thickened where it enters the symphysis; its teeth are all very small, and for at least the anterior half of the bone they are arranged in a single series, while beyond they appear to be clustered. The angular element (*ag.*) is large, forming the greater part of the coronoid region, and immediately above it is an elongated coronoid bone (*cor.*) completing the elevation. The articular (*ar.*) exhibits a convex facette at the extreme hinder end of the mandibular ramus, but whether or not this element is fused with the angular is as yet undetermined. The epihyal (Pl. IX. figs. 1, 1 *a*, *ep.h.*) is small and triangular in form, with a robust facette near the hinder end of its upturned margin; its extreme length is scarcely more

than one third that of the ceratohyal (*c.hy.*), which shows no evidence of twisting, is twice as deep behind as in front, and is thickened at the anterior extremity for articulation with the hypohyal. The hypohyal (Pl. IX. fig. 2) is especially robust, narrowed and turned inwards at its anterior end.

Opercular, Branchiostegal, and Branchial Apparatus.

The gill-covers form a complete series of plates. The preoperculum is large and much expanded at its angle, where the exposed surface is rugose, and one specimen (Pl. IX. fig. 1, *p.op.*) exhibits a facette-like excavation of its lower extremity, as if it articulated with the inferior prominence at the hinder end of the mandible. The operculum, suboperculum, and interoperculum are large, and do not merit special description; the suboperculum has a large ascending process at its antero-superior angle (no. 29049). The branchiostegal rays (Pl. VIII. fig. 3, *br.*), slightly over twenty in number, are all broad, but the uppermost especially so, and their free ends are sometimes (*e.g.* no. P. 6904) shown to be pectinated. In advance of the branchiostegal rays there is a very large gular plate (Pl. VIII. fig. 3, *gu.*) extending between the mandibular rami for more than half their length. A detached example (Pl. IX. fig. 3), wanting its hinder portion, exhibits a slight longitudinal median keel in its anterior half.

The branchial arches are only known by fragments (Pl. VIII. fig. 5), which display the ordinary channelled bone, mixed with small tooth-like gill-rakers (*g.r.*) and slender calcified gill-filaments (*fil.*). One specimen (Pl. IX. fig. 1, *g.r.*) shows that some of the gill-rakers at least were fixed on the edge of little plates of bone, resembling those on the gill-arches of the modern *Amia*.

Axial Skeleton of Trunk.

The examples of *Caturus* from the Oxford Clay of Peterborough do not afford any additional information as to the axial skeleton of the trunk. The complete skeletons from the Lithographic Stone of Bavaria and France have already proved that the notochord was persistent and that the ossifications in its sheath were confined to separate hypocentra and pleurocentra. A detached abdominal hypocentrum from Peterborough, however, shown from three points of view in Pl. IX. figs. 5, 5*a*, 5*b*, is interesting for comparison, and bears the characteristic small lateral processes for the support of the ribs. Whether any vertebral element was fused with the basioccipital remains unknown.

Appendicular Skeleton.

Resting upon the rim of chondrocranium which projects behind the occipital border of the cranial shield is a single pair of large supratemporal plates, each tapering towards the middle line, and from beneath this shield there emerges behind a pair of still larger post-temporal plates marked with small pittings, apparently of the sensory canal-system, near its outer border (Brit. Mus. no. P. 6908 a). There is nothing worthy of remark in the imperfectly known pectoral arch which these elements support, and the number of the pectoral basals still remains to be discovered. There are, however, several good portions of pectoral fins, and when viewed from below these exhibit the slightly lobate form of the appendage (e. g. no. P. 6908 c). The slender anterior fulcra seem to have fused with the foremost ray, and this is hence remarkably stout; at its upper end it exhibits a very large concave articular facette. The hindermost rays of the fin are short and excessively delicate. The pelvic bones are separate, contracted mesially, and expanded at each end, and the small pelvic fin is fringed with conspicuous slender biserial fulcra. The fulcra on the median fins are also large, slender, and biserial, and the tips of a few of the gradually lengthening anterior rays of these fins are successively lost in the fulcral series (no. P. 6909). At the base of these fins, it may be added, the few fulcral scales are simple, not subdivided into two halves.

Squamation.

The scales are very thin over the whole of the trunk and only appear thickened on the atrophied upper caudal lobe (no. P. 6909). Their exposed face is distinctly rhombic and often punctate or partly striated, but chiefly marked by the concentric lines of growth.

[To be continued.]

XXXI.—On *Lepidoptera Heterocera* from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c.

[Continued from p. 235.]

Genus RUMIA.

(Dup.; Hampson, Fauna Brit. Ind., Moths, iii. p. 183 (1895).)

— *Rumia tridentifera*.

Rumia tridentifera, Moore, Lep. Atk. p. 80 (1887); Hampson, Fauna Brit. Ind., Moths, iii. p. 184 (1895).

Five male specimens and one female received from Tachien-lu, Pu-tsu-fong, and How-kow: June, July, and August.

In one example from Pu-tsu-fong the large spot is only outlined in black, the interior being brownish; in a specimen from How-kow this spot is entirely reddish brown and rather less in size than in the specimens from Western China.

Distribution. Sikkim (Hampson); Western China and Thibet.

— *Rumia trimaculata*, sp. n. (Pl. VI. fig. 9.)

Male.—Pale yellow. Primaries have a reddish patch at the base, an oblong one on costa extending to median nervure and enclosing a lunule, and a square one at apex; there are two indistinct wavy transverse lines, the first commencing in a reddish dot on costa, and the second from inner edge of the apical patch. Secondaries have a blackish central spot and narrow wavy band. Under surface yellow: inner margin of primaries whitish and the costa tinged with pinkish; there are two blackish transverse lines, but the first one is nearer the base of the wing than on upperside; discal spot large, blackish; apical spot reddish, but faint: secondaries have a blackish central spot and submarginal line. The central band of secondaries shows through on the under surface, and the basal line on under surface of primaries and the submarginal of secondaries are each more distinct than on the upper surface.

Expanse 50–56 millim.

Female deeper yellow, apical patch of primaries absent.

Six male specimens and five females received from Moupin, Che-tou, Pu-tsu-fong, Wa-ssu-kow, Ta-chien-lu, and How-kow: July.

Hab. Western China and Thibet.

— *Rumia inornataria*, sp. n.

Sulphur-yellow. Primaries have an annulation at end of cell and two transverse lines on outer marginal area. Secondaries have a discal dot, a central band, and line beyond. All these markings, with the exception of the central band on primaries, are shadowy and indistinct. The costa of primaries is narrowly tinged with pink, and the fringes are slightly tinted with the same colour. Under surface: primaries have a subbasal line, annulation at end of cell, and a submarginal line, all rather clearer than above: secondaries have a central and a submarginal line, but neither are very distinct.

Expanse 50 millim.

One female specimen from Che-tou, July.

Hab. Western China.

* *Rumia sulphurea*.

Rumia sulphurea, Butl. Ann. & Mag. Nat. Hist. (5) vi. p. 123 (1880); Ill. Typ. Lep. Het. vi. p. 54, pl. cxiv. fig. 6 (1886); Alph. Rom. sur Lép. vi. p. 51 (1892).

Alphéraky records one female specimen from the Province of Szechuen, taken in August.

Distribution. Sikkim (*Hampson*); Western China (*Alphéraky*).

Genus CORYMICA.

(Walk.; *Hampson*, Fauna Brit. Ind., Moths, iii. p. 185 (1895).)

—*Corymica specularia*.

Caprilia specularia, Moore, Proc. Zool. Soc. Lond. 1867, p. 649, pl. xxxiii. fig. 11.

Thiopsyche Pryeri, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 393 (1878); Ill. Typ. Lep. Het. iii. p. 29, pl. xlviii. fig. 2 (1879).

Corymica vitrigera, Butl. Ill. Typ. Lep. Het. vii. p. 101, pl. cxxxv. fig. 14 (1889).

Corymica specularia, *Hampson*, Fauna Brit. Ind., Moths, iii. p. 186 (1895).

Appears to be common in Central and Southern Japan; it also occurs at Gensan in Corea and at Chia-ting-fu, Moupin, and Omei-shan in Western China, and Chang-yang in Central China.

Varies a good deal in depth of colour and also in definition of marking.

The Chia-ting-fu specimen agrees with *C. vitrigera*, Butl., which *Hampson* considers synonymous with *C. specularia*.

Distribution. Dharmasala; Sikkim; Nilgiris; Ceylon (*Hampson*); Japan; China.

Corymica gensanaria.

Corymica gensanaria, Leech, Entom., Suppl. p. 50 (May 1896).

One female specimen from Gensan, taken in July.

Hab. Corea.

Genus ILICRINIA.

(Hübner; *Hampson*, Fauna Brit. Ind., Moths, iii. p. 186 (1895).)

—*Ilicrinia cordiaria*.

Geometra cordiaria, Hübner, Geom. pl. viii. fig. 41, pl. lxvi. fig. 342.

Ilicrinia cordiaria, Hübner, Verz. Schm. p. 287; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 111.

Ilicrinia nuptaria, Brem. Lep. Ost-Sib. p. 80, pl. vii. fig. 5.

Ilicrinia cordiaria, *Hampson*, Fauna Brit. Ind., Moths, iii. p. 186.

There were several examples of the *nuptaria* or pale yellow form of this species in Pryer's collection.

Distribution. South Europe; Syria; Kirghistan; Amur; Japan; Yesso; Kulu.

Ilicrinia flava.

Noreia flava, Moore, Lep. Atk. p. 233, pl. viii. fig. 2 (1887).

Ilicrinia flava, Hampson, Fauna Brit. Ind., Moths, iii. p. 187 (1895).

There is a specimen in the National Collection from Chekiang.

Distribution. Eastern China; Sikhim; Khâsis; Nágas.

Genus *SPILOPERA*.

(Warr. Proc. Zool. Soc. Lond. 1893, p. 402.)

Spilopera debilis.

Heterolocha debilis, Butl. Ill. Typ. Lep. Het. ii. p. 47, pl. xxxv. fig. 9 (1878).

Spilopera debilis, Warr. Proc. Zool. Soc. Lond. 1893, p. 402.

There was a series in Pryer's collection. I took the species at Gensan in July, and I have received it from Hakodate. Pratt met with it at Chang-yang in June and July.

Distribution. Japan; Yesso; Corea; Central China.

Spilopera gracilis.

Endropia gracilis, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 371 (1879).

Parachipsis gracilis, Warren, Novit. Zool. i. p. 403 (1894).

Spilopera gracilis, Hampson, Fauna Brit. Ind., Moths, iii. p. 190 (1895).

Several specimens in Pryer's collection. I took examples at Tsuruga and Gensan in July.

Hampson considers *S. umbrata*, Warr., to be synonymous with *S. gracilis*, Butl.

Distribution. Central and Southern Japan; Corea; Khâsis; Assam.

Spilopera obliquilinea.

Epione obliquilinea, Moore, Lep. Atk. p. 229 (1887).

Spilopera obliquilinea, Hampson, Fauna Brit. Ind., Moths, iii. p. 192 (1895).

Five male specimens from Ichang and a female from Moupin, June and July.

Distribution. Eastern Himalayas; Central and Western China.

Spilopera angularia, sp. n.

Yellowish buff, suffused with brownish; outer marginal

area of all the wings tinged with rosy; a blackish-brown line commencing one fifth from apex of primaries is acutely angulated below apex and traverses both wings, terminating on middle of the abdominal margin; this line is inwardly shaded with olive-brown and followed at its termination by a blackish patch; there is a brown annular discal spot on primaries. Fringes brown. Under surface yellow, freckled with violet-grey; outer marginal area of all the wings clouded with rosy and limited by a violet-grey band; discal spot on primaries as above.

Expanse 31 millim.

Two male specimens from Kia-ting-fu, June.

Hab. Western China.

Allied to *Spilopera obliquilinea*, Moore.

Spilopera crenularia, sp. n.

Apex of primaries pointed, outer margin below apex crenulate to obtuse angle at end of third median nervule; outer margin of secondaries crenulate, angled about the centre. Pale ochreous, powdered with darker on outer marginal area. Primaries have two transverse rufous lines, the first is angulated below the costa, the second is parallel with outer margin and is followed on apical area by an almost square reddish patch with a rosy centre. Secondaries have an oblique rufous central line and an undulated dusky one beyond, but the latter is not clearly defined. Fringes pale brown, marked with darker. Under surface similar to above, but the outer line on primaries is broader and the outer one on secondaries more distinct.

Expanse 32 millim.

One male specimen from Chang-yang, August.

Hab. Central China.

Spilopera (?) *roseimarginaria*, sp. n.

Pale ochreous, clouded with pinkish, especially on costal and basal area of primaries; the basal area of primaries is limited by a diffuse fuscous band, which is angulated below costa; median band also fuscous and diffuse; outer marginal area greenish fuscous, tinged with rosy, mottled with blackish, and limited by a fuscous line obliquely angled below costa. Secondaries have a blackish discal dot and an interrupted diffuse central band; outer marginal area rosy, limited by a fuscous line, which is slightly incurved below costa. Fringes fuscous brown. Under surface rather more

yellow, and the outer area of secondaries is not rosy, but yellow, suffused inwardly with fuscous.

Expanse 40 millim.

One male specimen from Chang-yang and an example of each sex from Omei-shan, July.

Hab. Central and Western China.

Spilopera? divaricata.

Agathia? divaricata, Moore, Lep. Atk. p. 250, pl. viii. fig. 15 (1887).

Spilopera? divaricata, Hampson, Fauna Brit. Ind., Moths, iii. p. 192 (1895).

One male specimen from Omei-shan, July.

Distribution. Khâsis; Western China.

Genus CRYPSICOMETA.

(Warren, Novit. Zool. i. p. 463 (1894).)

Crypsicometa incertaria.

Phasiane incertaria, Leech, Entom., Suppl. p. 49 (May 1891).

Phasiane incertaria, var. *suffusa*, Leech, l. c.

Crypsicometa incertaria, Warren, Novit. Zool. i. p. 463 (1894).

Several specimens of the type form from Yokohama (?) and Gifu in Pryer's collection, as well as an example of *suffusa* from each locality. Two examples of the var. *suffusa* were taken by my native collector in Kiushiu, and I received one female specimen of that form from Moupin, taken in July.

Distribution. Japan; Kiushiu; Western China.

Genus NADAGARA.

(Walk.; Hampson, Fauna Brit. Ind., Moths, iii. p. 193 (1895).)

Nadagara albovenaria, sp. n.

Pale brown, striated and freckled with blackish; neuration whitish. Primaries have two whitish lines, both oblique; the first is angled below the costa and outwardly edged with dark brown; the second is inwardly edged with blackish and preceded by a dark brown suffusion; there is a short oblique blackish dash from apex; discal spot black. Secondaries have a black discal spot and a whitish slightly curved line inwardly edged as on primaries. Fringes pale brown, traversed by a line of dark brown, chequered with dark brown on the primaries, except below apex, where there is a blackish spot, and preceded by a dark brown line. Under surface whitish brown, irrorated with fuscous, except on abdominal

margin of secondaries; discal spot and outer line as on upper surface.

Expanse 40 millim.

One example of each sex in Pryer's collection.

Hab. Japan.

Allied to *N. vigaia*, Walk.

Genus RHYNCHOBAPTA.

(Hampson, Fauna Brit. Ind., Moths, iii. p. 194 (1895).)

Rhynchobapta cervinaria.

Noreia cervinaria, Moore, Lep. Atk. p. 233 (1887).

Rhynchobapta cervinaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 194 (1895).

Lozogramma (?) *bilineata*, Leech, Entom., Suppl. p. 48 (May 1891).

There were several specimens from Gifu in Pryer's collection. I have also received examples from Ichang and Changyang and from Omei-shan.

Distribution. Sikhim; Khásis (Hampson); Japan; Central and Western China.

Rhynchobapta punctilinearia.

Nadagra punctilinearia, Leech, Entom., Suppl. p. 55 (May 1891).

I obtained some specimens, including both sexes, at Nagasaki in May, and my native collector also met with examples in the island of Kiushiu.

Hab. Kiushiu.

Rhynchobapta flaviceps.

Nadagara flaviceps, Butl. Trans. Ent. Soc. Lond. 1881, p. 419.

Rhynchobapta flaviceps, Hampson, Fauna Brit. Ind., Moths, iii. p. 195 (1895).

I obtained this species at Fushiki and Tsuruga in July and at Nikko in September. Mr. Manley sent me specimens from Yokohama, and I have received examples from Kiushiu, where they were taken by a native collector.

It also occurs in June at Ichang and at Omei-shan in July, but I have only one example from each of these localities.

Distribution. Khásis (Hampson); Japan; Central and Western China.

Rhynchobapta flavicostaria, sp. n.

Leadens grey, without traces of transverse bands; all the wings have a black discal spot; costa of primaries yellow;

fringes yellow. Under surface as above, but fainter in colour.

Expanse 27 millim.

One female specimen from Ichang, June.

Hab. Central China.

Genus LUXIARIA.

(Hampson, Fauna Brit. Ind., Moths, iii. p. 195 (1895).)

— *Luxiaria contigaria*.

Acidalia? *contigaria*, Walk. Cat. Lep. Het. xxii. p. 754 (1861).

Acidalia inexactata, Walk. *op. cit.* xxiii. p. 770.

Acidalia tephrosaria, Moore, Proc. Zool. Soc. Lond. 1867, p. 643.

Luxiaria fasciosa, Moore, Lep. Atk. p. 254 (1887).

Luxiaria contigaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 195 (1895).

Bithia amasa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 405 (1878); Ill. Typ. Lep. Hot. iii. p. 45, pl. lii. fig. 4 (1879).

This species appears to be common in Western China, and all the forms enumerated above are represented. There was a series of the *fasciosa* (*amasa*) form from Ohoyama in Pryer's collection; I obtained specimens of the same form at Tsuruga and Gensan in July, and my collectors at Chang-yang and in the island of Kiushiu.

Distribution. Dharmasála; Sikhim; Khásis; Mahableshtar; Nilgiris; Ceylon; Sumatra; Borneo (*Hampson*); Japan; Kiushiu; Corea; Central and Western China.

— *Luxiaria consimilaria*, sp. n.

Whitish, irrorated with greyish brown, most densely on costal area of primaries; there are three transverse pale pinkish-brown bands on primaries, but the first two are obscure, the third is fairly broad and extends from the apex to middle of the inner margin; this band is preceded by a series of black dots originating on the costa about one fourth from apex; there are also indications of a wavy submarginal line. Secondaries have three transverse bands; the first of these appears to be a continuation of the third on primaries; the second is fairly broad and is edged inwardly by a wavy blackish line; submarginal line obscure. Fringes whitish brown, preceded by a thin blackish line, which is dotted with black at the extremities of the nervules. Under surface whitish, freckled with greyish brown on primaries, especially on costal and basal areas; all the wings have two transverse dusky bands and a blackish discal spot.

Expanse 35 millim.

One male specimen from Moupin and one male and two females from Omei-shan, July.

Hab. Western China.

Closely allied to *L. obliquata*, Moore. Perhaps only a local form of that species.

Genus KRANANDA.

(Moore, Proc. Zool. Soc. Lond. 1867, p. 048.)

Krananda semihyalina.

Krananda semihyalina, Moore, Proc. Zool. Soc. Lond. 1867, p. 048; Hampson, Fauna Brit. Ind., Moths, iii. p. 199 (1895).

I met with this species at Nagasaki in May, and there were a few specimens in Pryer's collection from Central Japan.

Distribution. Dalhousie; Sikhim; Khâsis (Hampson); Japan; Kiushiu.

Krananda lucidaria, sp. n. (Pl. VI. fig. 10.)

Basal two thirds of primaries and half of secondaries diaphanous, clouded with brownish; outer third of primaries and half of secondaries clouded with purplish brown, except on the outer margin of the latter.

Primaries have a velvety black subbasal band transversely intersected by a pale sinuous line; on the inner margin towards the boundary of the diaphanous area there is a slightly oblique velvety-black bar, this is twice interrupted; there are some pale brown marks on costa before apex and on outer margin below apex; submarginal band sinuous, pale brown, bordered inwardly with dusky, but suffused below the costal portion. Secondaries irrorated with blackish; a brown cloud represents a diffuse oblique band terminating in a black mark just before abdominal margin; discal spot black; submarginal band pale, but not clearly defined. Under surface: basal portion of the wings whity brown, outer portion (except at apex of primaries and upper angle of secondaries) ferruginous brown, merging into ochreous on outer margin of secondaries; primaries have a ferruginous-brown crescent in the cell, which meets an elbowed transverse line of the same colour; secondaries have a slightly curved subbasal band, also ferruginous brown.

Expanse 58 millim.

One female specimen from Omei-shan, July.

Hab. Western China.

Krananda latimarginaria.*Krananda latimarginaria*, Leech, Entom., Suppl. p. 56 (May 1891).*Trigonoptila latimarginaria*, Warren, Novit. Zool. i. p. 441 (1894).

There were specimens in Pryer's collection. I have also received the species from Nikko and Gensan, July.

Distribution. Japan; Corea.

Krananda oliveomarginata.

Krananda oliveomarginata, Swinh. Ann. & Mag. Nat. Hist. (6) xiv. p. 189.

One specimen from Omci-shan, July.

Distribution. Khâsis; Western China.

Genus ZANCLOPERA.

(Warren, Novit. Zool. i. p. 441 (1894).)

Zanclopera straminearia, sp. n.

Pale stramineous. Primaries have the base and costa tinged with pale ferruginous, and there is a transverse band of the same colour beyond the middle with some black dots inside it towards inner margin; this band is continued on the secondaries. Under surface similar to above, but all the wings have a black discal dot, and the transverse bands have black dots on them.

Expanse 40 millim.

One male specimen from Chang-yang, June.

Hab. Central China.

Genus MACARIA.

(Curtis; Hampson, Fauna Brit. Ind., Moths, iii. p. 201 (1895).)

Macaria hebesata.

Macaria hebesata, Walk. Cat. Lep. Het. xxiii. p. 931; Butl. Ill. Typ. Lep. Het. iii. pl. lii. fig. 1.

Macaria sinicaria, Walk. Cat. Lep. Het. xxvi. p. 1650.

Macaria proditaria, Brem. Lep. Ost-Sib. p. 81, pl. vii. fig. 7.

Macaria maligna, Butl. l. c. pl. lii. fig. 3.

Macaria irrorata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 440.

I have an extensive series of this very variable species, which was common in most of the localities in Japan that I visited, with the exception of the island of Yesso, where I did not see a specimen. Pryer, who had a fine series, seems to have considered that *irrorata* was distinct from *sinicaria*, but in his 'Catalogue of the Lepidoptera of Japan' he states,

when referring to *sinicaria*, "*hebesata* I believe to be the male, *maligna* the female." I must confess, however, that I cannot satisfactorily separate the specimens in my series into even two species. The series comprises examples agreeing respectively with each of the named forms, and all these are connected by intergrades; so that it is not possible to parcel them out into well-defined groups of varieties. It seems most probable that *hebesata* is the Asiatic representative of the European *astimaria*.

Meyrick (Trans. Ent. Soc. Lond. 1892, p. 103) places *proditaria*, Brem., in *Opisthograptis*.

Distribution. China; Japan; Corea; Amur; E. Siberia; N. India.

— *Macaria pervolgata*.

Macaria pervolgata, Walk. Cat. Lep. Het. xxiii. p. 930 (1861); Hampson, Fauna Brit. Ind., Moths, iii. p. 205 (1895).

Two female specimens from Chang-yang, June and August. One male example from Chia-ting-fu, July, and three females from the island of Kiushiu. In one female from Chang-yang the ground-colour is suffused with pale brownish, the discal spot is very minute, and there are no black spots beyond the outer line of secondaries.

Distribution. Bengal; Poona (*Hampson*); Central and Western China; Kiushiu.

— *Macaria defixaria*.

Macaria defixaria, Walk. Cat. Lep. Het. xxiii. p. 932 (1861).

Macaria zuchera, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 405 (1878); Ill. Typ. Lep. Het. iii. p. 45, pl. lii. fig. 2 (1879).

A common species in Central and Southern Japan. I have received it from Gensan and Ningpo. It also appears to be common in Central and Western China, July.

Distribution. Japan; Yesso; Eastern, Central, and Western China.

— *Macaria intermediaria*, sp. n.

Allied to *M. defixaria*, Walk., but the ground-colour is more suffused with brownish and the angulation of secondaries is less pronounced; the angle of third line of primaries is further from outer margin, and below the angle the line is less oblique. On the under surface the outer lines on both wings are more broadly suffused with ochreous. The black spots beyond the centre of transverse band are somewhat similar to the same character in *M. defixaria*.

Expanse, ♂ 84, ♀ 89 millim.

One example of each sex from Wa-shan and two females from Chia-ting-fu, July.

Hab. Western China.

— *Macaria oacularia*.

Macaria oacularia, Oberth. Etud. d'Entom. xv. p. 24, pl. iii. fig. 32 (1891).

Occurs at Chia-kou-ho, Chia-ting-fu, Huang-mu-chang : July. I received specimens from each locality.

Hab. Western China.

— *Macaria monticolaria*, sp. n.

Violet-grey. Primaries have three transverse lines ; the first and second are elbowed below costa and near together, but not well defined ; the third has an upward angulation below costa, bordered below the angle by a dusky shade and on the costa by a diffuse bracket-shaped mark. Secondaries have two transverse lines ; the first is faint, but the second is double and well developed ; beyond the outermost there is a deep black spot and some scales of the same colour indicating a second spot. All the wings have a faint blackish discal dot. Fringes pale, marked with darker at the extremities of the nervules and shaded with darker towards costa of primaries. Under surface whitish, coarsely speckled with dark brown : there are two dark, almost blackish lines on each wing ; the first is oblique, wavy, and the second oblique and curved towards costa of secondaries ; beyond the second line the outer margin is dark brown marked with ochreous, and there are patches of the ground-colour at apex and towards inner angle of primaries, and between the anal angle and the middle of outer margin of secondaries.

Expanse 36 millim.

One male specimen from the summit of Oinei-shan, July.

Hab. Western China.

Allied to *M. intermediaria*.

— *Macaria elongaria*, sp. n. (Pl. VI. fig. 14.)

Apex of primaries obtusely produced ; outer margin of secondaries crenulate, with a small angular projection about the middle.

Whitish grey, powdered and clouded with brownish. Primaries have three transverse oblique brown lines, commencing as spots of the same colour on the costa ; the first is elbowed below costa, the second has a slightly darker discal spot on it ; the third is followed on the costa, below which it

is elbowed, by a rufous patch, and has a series of blackish marks, intersected by a thin white line, on its outer edge between the inner margin and the third median nervule; there is a brownish cloud below apex. Secondaries have two brown lines; the first is oblique, the second double, curved, slightly wavy, and enclosing a pale line; there are a series of black specks indicating a submarginal line, and the discal spot is black. Fringes pale at their base, darker outwardly, and preceded by a brown line. Under surface whitish, freckled with brownish, and tinged with ochreous on costa of both wings; brown transverse lines, except the first of primaries, which is absent, darker and broader than above; the outer one on each wing is followed by an outwardly diffuse band, which does not reach the inner margin in either case, and there are no black marks on that of primaries; the apical area beyond the outer line is brown, tipped with whitish; discal spot black.

Expanse 44 millim.

One male specimen from Moupin, July.

Hab. Western China.

On the under surface the markings approach those of *M. intermediaria*.

Macaria proximaria.

Parasemia Pryeri, Butl. Trans. Ent. Soc. Lond. 1881, p. 417 (nom. provoc.).

There was a fine series from Central Japan in Pryer's collection. I met with the species at Nagasaki in May and at Gensan in June. It also occurs in Central and Western China in June and July.

Distribution. Japan; Kiushiu; Corea; Central and Western China.

Macaria shanghaiaria.

Macaria shanghaiaria, Walk. Cat. Lep. Het. xxiii. p. 926 (1861).

Semiothisa (Macaria) graphata, Hedem. Horæ Soc. Ent. Ross. xvi. p. 51, pl. x. fig. 4 (1881).

There were a few specimens in Pryer's collection. I captured the species at Tsuruga in July and at Hakodate in August.

This species seems far more closely allied to *M. alternata* than to *M. notata*, with which latter Hedemann compares his *graphata*. I am inclined to think that it may be a local form of the first-named, which occurs in Amurland.

Distribution. N. China; Japan; Yesso; Amur.

Graphata, Hedem., is included in the genus *Opisthograptis*, Hüb., by Meyrick (Trans. Ent. Soc. Lond. 1892, p. 103).

Macaria Pryeri.

Macaria Pryeri, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 437 (1879).

There were specimens from Yokohama and Oiwake in Pryer's collection, and my native collector obtained a specimen in the island of Kiushiu.

Hab. Japan and Kiushiu.

Macaria intersectaria, sp. n.

Very near to *M. temeraria*, Swinh., but the second and third transverse lines of primaries are not sinuous; the latter is double, enclosing a pale buff line, obtusely angled below costa, and has a small black mark, intersected by the venation, above the middle; between the first and second lines there is a dusky diffuse band, which is continued on the secondaries; the submarginal white line commences at apex and terminates just above inner angle; it is slightly incurved about the middle, and there is a whitish patch in this curve. On the secondaries the white submarginal line terminates just before anal angle; there is a dusky band on central area, tapering towards costa and marked with black dots on the neuration. Under surface very similar to that of *M. temeraria*, but the transverse lines are not wavy.

Expanse 40 millim.

One male specimen from Pu-tsu-fong, July.

Hab. Western China.

—*Macaria temeraria*.

Macaria temeraria, Swinh. Trans. Ent. Soc. Lond. 1891, p. 492; Hampson, Fauna Brit. Ind., Moths, iii. p. 207 (1895).

I took specimens at Ning-po in April and at Nagasaki in June, and I have received the species from Chang-yang, where it was taken in July.

Distribution. Simla; Khásias; Nágas (*Hampson*); Kiushiu; Eastern and Central China.

—*Macaria ornataria*, sp. n.

Pale brownish grey. Primaries have two interrupted dusky transverse lines before the middle, each originating in a brown spot on the costa; beyond the middle is a blackish fascia extending from costa to just below first median nervule, interrupted by the venation and separated by a line of the

ground-colour from a similarly interrupted blackish patch on its lower outer edge; between this fascia and the apex of the wing there is a brown spot on the costa. Secondaries have a dusky oblique line, which appears to be a continuation of the second one of primaries; beyond the blackish discal dot there is a blackish patch, interrupted by the median nervules and transversely by a slightly wavy line, which is dusky above and below the patch, but appears to be of the ground-colour in passing through it. Fringes pale at their base, darker outwardly, and preceded by a dusky lunulated line. Under surface fuscous, variegated with silvery white and suffused with ferruginous on apical area of primaries and sub-marginal area of secondaries; the basal area of each wing is also irrorated with silvery white.

Expanse 28 millim.

Two male specimens and two females from Moupin, July.

Hab. Western China.

Genus OPISTHOGRAPTIS.

(Hübner; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 102 (part.).)

Opisthograptis semilutata.

Eubolia semilutata, Led. Sib. Schmett. p. 29, pl. vi. fig. 3.

Opisthograptis semilutata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 103.

Chorodes dictynna, Butl. Ill. Typ. Lep. Het. ii. p. 46, pl. xxxv. fig. 7 (1878).

Synegetis? *Fentoni*, Butl. Trans. Ent. Soc. Lond. 1881, p. 412.

Occurs throughout Japan, and I met with it at Gensan and at Ningpo. I have also received it from Chang-yang.

Distribution. Siberia; Japan; Yesso; Kiushiu; Corea; Central China.

This species is exceedingly variable in colour, which ranges from bright ochreous through brownish grey to bright reddish brown; the markings, however, are fairly constant.

Opisthograptis corearia.

Halva corearia, Leech, Entom., Suppl. p. 50 (May 1891).

I took two male specimens and one female in June and one example of each sex in July at Gensan. I have also two males from Ichang. One of the male specimens from Gensan is of a uniform brown colour on the upper surface, except towards apex, where the ochreous yellow of the type form is exhibited.

Distribution. Corea; Central China.

Genus STRENIA.

(Dup. Lép. i. p. 112.)

*Strenia clathrata.**Phal. Geometra clathrata*, Linn. Syst. Nat. x. p. 524; Clerck, Icon. pl. ii. fig. 11.*Geometra clathrata*, Hübn. Geom. fig. 132.*Chiasmia clathrata*, Hübn. Verz. Schmett. p. 295.*Strenia clathrata*, Dup. Lép. viii. pl. ccvii. fig. 1; Guen. Phal. ii. p. 112.*Opisthograptis clathrata*, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 103.

I captured specimens at Hakodate, June and July, and at Nemoro in August; there were also a few examples in Pryer's collection from Yesso.

Distribution. Europe; Armenia; Altai; Amur; Japan; Yesso.

Genus TEPHRINA.

(Dup. Cat. Lép. Eur. p. 246 (1844); Hampson, Fauna Brit. Ind., Moths, iii. p. 249 (1895).)

189

Tephрина verecundaria, sp. n.

Brownish grey, with a slight violet tinge, irrorated with fuscous. Basal area of primaries rather darker, limited by a fuscous line, which is slightly angulated below costa; discal spot black; transverse line beyond the middle dark brown, curved below costa; the space between this line and the dusky waved submarginal line, which is only distinct towards costa, is filled in with darker. Secondaries have a black discal spot and dark brown central line, the latter bordered outwardly with darker. Fringes of the ground-colour, preceded on the primaries by a black dotted line and on secondaries by a series of black lunules. Under surface whity brown, mottled with fuscous on basal two thirds of primaries and half of secondaries, and ochreous yellow on outer marginal area; the latter is limited by a fuscous line and traversed by a diffuse fuscous band; discal spot black on all the wings.

Expanse 29 millim.

Two female specimens from Chow-pin-sa, May and June.

This species superficially resembles *Macaria hebesata*, Walk., except that the transverse lines are not angulated.

Hab. Western China.

*Tephрина arenacearia.**Geometra arenacearia*, Hübn. Geom. fig. 114.*Tephрина arenacearia*, Guen. Phal. ii. p. 105.

Eubolia flavidaria, Eversm. Bull. Mosc. 1852, p. 162.

Tephрина flavidaria, Guen. Phal. ii. p. 104.

Diastictis arenacearia, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 103.

There were specimens of the typical form in Pryer's collection, and I took examples of the *flavidaria* form at Gensan in July.

Distribution. Europe; Amur; Corea; Japan.

Tephрина capulata.

Lozogramma capulata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 441 (1879).

There was a series from Yokohama and Oiwake in Pryer's collection, and I obtained specimens in Satsuma in May.

Hab. Japan; Kiushiu.

Tephрина brunneata.

Geometra brunneata, Thunb. Diss. Ent. i. p. 9 (1784).

Geometra pinetaria, Hübn. Geom. fig. 130, ♀ (post 1797).

Filonia pinetaria, Guen. Phal. ii. p. 157.

Diastictis brunneata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 103.

There were specimens from Oiwake in Pryer's collection.

Distribution. Europe; Altai; Amur; Japan.

Tephрина fuscaria.

Halia fuscaria, Leech, Entom., Suppl. p. 50 (May 1891).

Three specimens of each sex, from Oiwake and Yokohama, in Pryer's collection. One female from Ichang, August.

Distribution. Japan; Central China.

— *Tephрина adzearia.*

Halia adzearia, Oberth. Etud. d'Entom. xviii. p. 33, pl. iv. fig. 62 (1893).

I received one male specimen from Moupin, taken in June, and a female from Che-tou, taken in July.

Oberthür records the species from Ta-chien-lu.

Hab. Western China.

Tephрина (?) flavescens.

† *Eubolia flavescens*, Alph. Rom. sur Léop. vi. p. 68, pl. iii. fig. 6, ♂ (1892).

Alphéraky records one example of each sex, taken in September at Termine-Bachine, North-western China.

Genus HYPOSIDRA.

(Guen.; Hampson, Fauna Brit. Ind., Moths, iii. p. 212 (1895).)

— *Hyposidra aquilaria*.

Lagyr aquilaria, Walk. Cat. Lep. Het. xxvi. p. 1485.

Hyposidra aquilaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 214 (1895).

Hyposidra Davidaria, Pouj. Ann. Soc. Ent. Fr. 1895, p. 307, pl. vi. fig. 1.

I have specimens from Chang-yang, Ichang, Chia-ting-fu, Moupin, Omei-shan: June and July.

Distribution. Sikhim; Shillong; N. China (*Hampson*); Central and Western China.

[I received a series of *Hyposidra taluca*, Walk., from the Loo-choo Islands.]

Hyposidra falcigera.

Lagyr falcigera, Butl. Ill. Typ. Lep. Het. ii. p. 45, pl. xxxv. fig. 4 (1878).

Three female specimens in Pryer's collection from Yesso.

Hab. Yesso.

Genus POGONITIS.

(Christoph. Bull. Mosc. iv. p. 60 (1881).)

Pogonitis cumulata.

Pogonitis cumulata, Christoph. Bull. Mosc. iv. 2, p. 61 (1881).

Delinia cumulata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 110.

A fine series from Oiwake in Pryer's collection.

Distribution. Amur; Japan.

Genus DILINIA.

(Hübner; Hampson, Fauna Brit. Ind., Moths, iii. p. 216 (1895).)

Dilinia exanthemata.

Phalena exanthemata, Scop. Ent. Carn. p. 218.

Geometra exanthemaria, Esp. v. pl. xxxiii. figs. 8, 4.

Delinia exanthemata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 110.

Cabera exanthemaria, Guen. Phal. ii. p. 55.

I took one typical female specimen at Hakodate in August.

Alphéraky (Rom. sur Léop. vi. p. 56) records a very damaged female specimen from Ou-pin, Western China; possibly this is referable to the Chinese form of *D. Schæfferi*, which I have described as var. *sinicaria*.

Distribution. Europe; Armenia; Amur; Yesso.

—*Dilinia Schæfferi*.

Cabera Schæfferi, Brem. Lep. Ost-Sib. p. 80, pl. vii. fig. 4 (1864).

I obtained specimens at Gensan in June.

This species can be readily separated from its allies by the distinct yellow bands, which are not in the least serrated.

Var. *sinicaria*.

Pale ochreous white, irrorated with brownish. Primaries have three rather broad, wavy, ochreous transverse lines, the first two elbowed below costa, and the third angled. Secondaries have two wavy ochreous lines. Fringes of the ground-colour. Under surface paler than above; all the wings have a dusky discal dot and indications of a transverse line beyond.

Expanse 36 millim.

A good series received from Ta-chien-lu and Ni-tou, June.

Distribution. Amur; Corea; Western China.

Dilinia purus.

Thysanochilus purus, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 404 (1878);

Ill. Typ. Lep. Het. iii. p. 44, pl. li. fig. 12 (1879).

There was a good series from Yokohama in Pryer's collection. I took the species at Gensan and Mr. Smith at Hakone in June.

Distribution. Corea; Japan.

Dilinia conspersaria, sp. n.

White. All the wings have black discal and marginal spots. Primaries have three, and secondaries two, brownish macular bands. Under surface white, with black discal and marginal spots and a brownish macular submarginal band; the costal area of primaries is suffused with fuscous, especially towards the base.

Expanse, ♂ 38, ♀ 43 millim.

Two male specimens and six females from Oiwake in Pryer's collection.

The species varies in the intensity of the markings.

Hab. Japan.

—*Dilinia tinagmaria*.

Cabera tinagmaria, Ghen. Phal. ii. p. 56 (1857).

A number of specimens were received from Omei-shan and Moupin and one example from Chia-ting-fu, July. I took

the species at Ningpo in April and at Tsuruga in July; my native collector met with it in June and July at Ningpo, and also obtained specimens in the island of Kiushiu. Guenée's type was from North China. Pryer does not seem to have met with this species.

Distribution. North and Western China; Japan; Kiushiu.

Dilinia griseo-limbata.

Phasiane griseo-limbata, Oberth. Diagn. Lép. Ask. p. 1 (Aug. 1879);
Etud. d'Entom. v. p. 50, pl. iv. fig. 14 (1880).

Nematocampa straminea, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 370
(Sept. 1879).

Stegania griseo-limbata, Hedem. Horæ Soc. Ent. Ross. xvi. p. 245, pl. x.
fig. 2 (1881).

Segania ustulataria, Christ. Bull. Mosc. Iv. (2) p. 63 (1881).

Deilinia straminea, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 110.

There were specimens from Yokohama and Oiwake in Pryer's collection. I obtained the species at Hakodate in August.

Distribution. Askold; Amur; Japan; Yesso.

Dilinia capitata.

Pachydia capitata, Walk. Cat. Lep. Het. xxiii. p. 1019 (1861).

Tacparia ? morosa, Butl. Trans. Ent. Soc. 1881, p. 403.

Dilinia capitata, Hampson, Fauna Brit. Ind., Moths, iii. p. 217 (1895).

There were two specimens in Pryer's collection, and I received one from Mr. Manley taken at Yokohama.

Distribution. Throughout India and Ceylon (*Hampson*); Japan.

Dilinia fasciata.

Bargosa fasciata, Moore, Proc. Zool. Soc. Lond. 1867, p. 634, pl. xxxii.
fig. 8.

Bargosa rivulosa, Butl. Trans. Ent. Soc. Lond. 1881, p. 410.

Dilinia fasciata, Hampson, Fauna Brit. Ind., Moths, iii. p. 217 (1895).

Butler's type was from Tokio. I did not obtain this species in Japan, and there were no specimens of it in Pryer's collection.

Distribution. Sikhim; Khâsis; Japan (*Hampson*).

Dilinia rufofasciaria, sp. n.

Primaries pale ochreous brown; basal area tinged and clouded with rufous; before the black discal dot there is an obscure curved and recurved rufous transverse line, and beyond the dot a diffuse rufous transverse band, becoming obsolete towards costa and reduced towards inner margin;

on the outer margin there is a series of faint brownish spots. Secondaries ochreous brown; outer margin bordered with paler, the inner edge of the border wavy; discal dot black. Under surface pale ochreous brown; primaries have a dusky band beyond the middle.

Expanse 32 millim.

One male specimen from Chang-yang, July.

Hab. Central China.

Dilinia albifrontaria.

Phasianæ albifrontaria, Leech, Entom., Suppl. p. 49 (May 1891).

Several specimens from Gifu in Pryer's collection.

Hab. Japan.

Allied to *D. vexillaria*, Guen.

Genus TYCOONIA.

(Warren, Novit. Zool. i. p. 439 (1894).)

Tycoonina obliqua.

Tycoonina obliqua, Warren, Novit. Zool. i. p. 439.

I have not been able to see the type of this species.

Hab. Japan.

Genus HYPEPHYRA.

(Butler, Ill. Typ. Lep. Het. vii. p. 101 (1889).)

Hypephyra terrosa.

Hypephyra terrosa, Butl. Ill. Typ. Lep. Het. vii. p. 100, pl. cxxv fig. 17 (1889).

Five male specimens were received from Chang-yang, one female from Omci-shan, one male from Yokohama and one from the island of Kiushiu.

Distribution. Simla; Dharmasala (*Hampson*); Japan; Kiushiu; Western and Central China.

Hypephyra Pryeraria.

Taeparia Pryeraria, Leech, Entom., Suppl. p. 56 (May 1891).

Three male specimens and two females from Gifu in Pryer's collection.

Hab. Japan.

Genus CROCOTA.

(Hüb. ; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 118 ; (part)
Hampson, Fauna Brit. Ind., Moths, iii. p. 220 (1895).)

Crocota mundataria.

Phal. Geometra mundataria, Cram. Pap. Exot. iv. p. 248, pl. cccc. fig. H.

Geometra mundataria, Hüb. Geom. figs. 875, 538.

Aspilates mundataria, Guen. Phal. ii. p. 186 ; Alph. Rom. sur Lép. vi. p. 70 (1892).

Aspilates toughata, Feld. Reise Nov., Lep. v. pl. cxxix. fig. 12.

Crocota mundataria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 119.

There were specimens from Fujisan in Pryer's collection, and I obtained the species at Oiwake in June and July and at Gensan in June. Specimens have been received from Chang-yang and Kiukiang, taken in June ; Alphéraky notes the species from the IteI-got, a tributary of the Yellow River, N.W. China, taken in August.

Distribution. Europe ; Altai ; Armenia ; Siberia ; Amur ; Corea ; Japan ; Central and North-western China.

Crocota formosaria.

Aspilates formosaria, Eversm. Bull. Mosc. 1837, p. 54, 1844, iii. pl. xv. figs. 3 a, b ; Guen. Phal. ii. p. 185.

Crocota formosaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 119.

Aspilates gloriosaria, Boisj. Ind. Gen. p. 188.

Some examples from Oiwake and Yokohama in Pryer's collection. I obtained specimens at Fusan in June and at Gensan and Nagahama in July ; and my native collector took the species at Hakodate in June. One specimen was received from Chang-yang.

Distribution. Europe ; Amur ; Corea ; Japan ; Yesso ; Central China.

Crocota curvaria.

Aspilates curvaria, Evers. Bull. Mosc. 1852, i. p. 167 ; Alph. Rom. sur Lép. vi. p. 70, pl. iii. figs. 5 a, b, c, ♂ ♀ (1892).

One female is recorded by Alphéraky from the province of Chan-si, taken in June.

Distribution. Siberia ; North-west China.

Crocota sordida.

Cleogene sordida, Butl. Trans. Ent. Soc. Lond. 1881, p. 418.

Butler describes this species from Tokio.

Hab. Japan.

— *Crocota* (?) *punctaria*, sp. n.

Pale ochreous brown, irrorated and mottled with dark greyish brown; there is a fuscous discal spot and a transverse series of fuscous spots placed on the inner edge of a dusky band on outer marginal area. Secondaries whitish brown, with a blackish discal spot and a transverse series of blackish spots beyond the middle, the third and fifth larger than the others. Fringes greyish. Under surface as above, but the primaries are suffused with fuscous and the secondaries are irrorated with fuscous and tinged with ochreous on the costa and outer margins.

Expanse 50 millim.

One male specimen from How-kow, July.

Hab. Thibet.

Crocota (?) *geholaria*.

Aspilates geholaria, Oberth. Etud. d'Entom. vi. p. 18, pl. ix. fig. 3 (1881).

I am unacquainted with this species, but, judging from the figure, which represents a female, it does not appear to be rightly placed in *Aspilates*, Treit., = *Crocota*, Hübner.

Oberthür records it from the Géhol Mountains and also from the mountains to the north of Peking.

Genus DISCOREBA.

(Butler, Ann. & Mag. Nat. Hist. (5) i. p. 394 (1878).)

Discoreba simplex.

Discoreba simplex, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 394 (1878);

Ill. Typ. Lep. Het. iii. p. 30, pl. xlviii. fig. 4 (1879).

Aspilates violentaria, Christ. Bull. Mosc. iv. (2) p. 82 (1881).

There were specimens of the typical form from Yokohama and Gifu in Pryer's collection.

Var. *punctaria*.

In both sexes of this form the transverse band of primaries is replaced by an oblique series of dots on the neuration. The ground-colour of the male is browner, and the primaries of the female are thickly dusted with blackish.

There were examples of this form in Pryer's collection, one of which was from Gifu.

Distribution. Japan; Amur.

Genus HYBERNIA.

(Latr. ; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 120.)

Hybernia leucophæaria.*Geometra leucophæaria*, Schiff. Wien. Verz. p. 101; Hübn. Geom. fig. 195.*Hybernia leucophæaria*, Dup. Léop. vii. pl. 153. figs. 4, 5; Guen. Phal. ii. p. 251.*Hybernia dira*, Butl. Ill. Typ. Lep. Het. iii. p. 50, pl. liii. fig. 7 (1879).

Several specimens from Yokohama in Pryer's collection.

Dira, Butl., is an unusually large specimen of *H. leucophæaria*. I have but one example in my series of the species which equals the type of *dira* in expanse, although several agree with the said type in other characters. The large specimen referred to was in Pryer's collection, and there was also a specimen which hardly expands one inch in the same collection.

The specimens from Japan exhibit considerable variation, but only one of the forms is peculiar; and as I have not seen an exact counterpart of it from Europe, I append the following description:—

Var. *nigrilinearia*.

Primaries pale ochreous grey; second line deeply indented below the middle; space between this line and the curved basal line thickly sprinkled with black scales, forming a dark median fascia, in the central portion of which is placed a pale oval patch; median nervure conspicuously black; before the apex is a blackish, oblique, abbreviated fascia. Secondaries normal.

Distribution. Europe; Japan.

Hybernia bela.

Iozogramma bela, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 406 (1878); Ill. Typ. Lep. Het. iii. p. 46, pl. lii. fig. 5 (1879).

Several male specimens from Yokohama in Pryer's collection.

Pryer, referring to this species in his 'Catalogue of the Lepidoptera of Japan,' p. 73, says "the female is semiapterous, like *Hybernia progemmaria*."

Hab. Japan.

Hybernia verecundaria, sp. n.

White, finely irrorated with fuscous, especially on pri-

maries. There are three transverse blackish lines on primaries—the first is slightly curved, the second serrated and curved to just above inner margin, where it is obtusely angled, the third is interrupted and merges into the dusky submarginal line at fourth vein; there is a blackish transverse dash on costa just beyond the first line and a dusky dot below it at the origin of second vein. Secondaries have a blackish transverse wavy line just beyond the middle; this does not extend to the costa, and on the inner margin is preceded by one and followed by two blackish marks. Fringes of the ground-colour preceded by blackish dots. Under surface whitish, suffused with fuscous, especially on the primaries; all the wings have a dusky discal mark, and the transverse lines of upper surface are faintly indicated.

Expanse 42 millim.

One male specimen in Pryer's collection.

Hab. Japan.

- Genus APOCHEIMA.

(Hübner; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 121.)

-*Apocheima lefuaria*.

Biston lefuarius, Erschoff, Horæ Soc. Ent. Ross. viii. p. 317 (1872); Hedem. xvi. p. 246, pl. xiii. fig. 13 (1881).

Nyssiodes olgaria, Oberth. Etud. d'Entom. v. p. 44, pl. iv. fig. 12 (1880).

Ereuva maturaria, Christ. testo Hedem. Horæ Soc. Ent. Ross. xvi. p. 247.

Eremia maturaria, Christ. Bull. Mosc. iv. (2) p. 64 (1881); Stett. ent. Zeit. liv. p. 35 (1893).

Apocheima lefuaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 121.

There were some nice specimens from Yokohama in Pryer's collection. Mr. Andrews and my native collector took examples at Hakodate in June, and I received a male specimen from Chung-king.

Distribution. Amur; Askold; Japan; Yesso; Western China.

Genus PHIGALIA.

(Duponchel, Lép. iv. p. 296.)

Phigalia sinuosaria, sp. n.

Resembles *P. pedaria* from Europe, but the transverse markings of primaries are more wavy, the subbasal being angled below the middle and the submarginal nearer the margin of the wing; the central line of secondaries is serrated and always beyond the discal spot, and the outer line is evenly

curved. Larger than *P. pedaria*, and the thorax is far less robust.

Expanse 48–58 millim.

Four male specimens from Yokohama in Pryer's collection.

Hab. Japan.

Genus ZAMACRA.

(Meyrick, Trans. Ent. Soc. Lond. 1892, p. 121.)

Zamacra albofasciaria.

Apocheima albofasciaria, Leech, Entom., Suppl. p. 48 (May 1891).

Three male specimens from Yokohama in Pryer's collection.

Hab. Japan.

The genus *Zamacra* was founded by Meyrick (Trans. Ent. Soc. Lond. 1892, p. 121) for *flabellaria*, Heeg., previously placed in *Apocheima*, Hübn.

Genus BISTON.

(Leach; Hampson, Fauna Brit. Ind., Moths, iii. p. 245 (1895).)

—*Biston emarginaria*, sp. n. (Pl. VII. fig. 8.)

Outer margins of all the wings with two deep indentations.

Female.—Primaries white, sparingly freckled with black; the basal area limited by an angulated black line and clouded with brown; outer marginal area brown, limited inwardly by a sinuous black line and intersected by an indistinct dusky-bordered whitish line, which terminates in a whitish patch at inner angle. Secondaries have the basal two-thirds sparingly freckled with black; the outer third is brown, bounded inwardly by a rather wavy black line and containing two white patches; the lower, placed at anal angle, is marked with black. Under surface similar to upperside, but there is no brown on basal area of primaries. Fringes: of primaries blackish from costa to second indentation, thence white chequered with black; of secondaries white, marked with brown at the angle. Antennæ white marked with black, simple. Head and thorax creamy, the latter sprinkled with black. Abdomen pale brown, marked with white and dotted with black.

Expanse 65 millim.

One female specimen from Pu-tsu-fong, June.

Hab. Western China.

—*Biston robustum*.

Biston robustum, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 371 (1879).

A very fine series from Yokohama in Pryer's collection.

In one example of the male the ground-colour is decidedly greyish.

—Var. *parva*, nov.

Much smaller than the type; the inner line of primaries is less acutely angled below costa, and the outer line rather more sharply angled. The male has the pectination of antennæ shorter, and is without brown or ochreous in the composition of its colouring and agrees almost exactly with the female, which is typical except as regards the minor points of difference referred to.

Expanse, ♂ 56, ♀ 64 millim.

One male specimen from Pu-tsu-fong, one female from Che-tou, and another from Ta-chien-lu: July.

Distribution. Japan; Western China.

—*Biston regalis*.

Amphidasya regalis, Moore, Lep. Atk. p. 234 (1887).

Biston regalis, Hampson, Fauna Brit. Ind., Moths, iii. p. 245 (1895).

One male specimen from Ichang taken in June.

There is an example from Hakodate in the National Collection, and this, like the specimen from Central China referred to above, has the basal, medial, and apical areas whiter than in the Indian form.

Distribution. N.W. Himalayas; Khâsis (Hampson); Yesso; Central China.

Biston tendinosaria.

Amphidasya tendinosaria, Brem. Lep. Ost-Sib. p. 73, pl. vi. fig. 17 (1864).

Phthonosema tendinosaria, Warr. Novit. Zool. i. p. 428 (1864).

There were specimens from Yokohama, Oiwake, Nikko, and Yesso in Pryer's collection.

I took the species at Gensan in June and at Fushiki in July, and it has also been obtained at Tokio.

Distribution. Amur; Corea; Japan; Yesso.

[*Biston fasciaria*, Motsch. Bull. Mosc. xxxix. p. 197.—I am unable to identify this species.]

—*Biston serratilinearia*, sp. n.

Whitish brown, powdered with grey. Basal area of primaries rusty brown, bordered with darker; outer line black, serrated, followed by a diffuse rusty-brown band; sub-marginal line of the ground-colour; discal spot blackish, with

a dark brown cloud above it on the costa. Secondaries have a dusky transverse central shade (sometimes present also on the primaries), and beyond this there is a black serrated line followed by a band as on primaries; submarginal line of the ground-colour; discal spot blackish. Fringes concolorous with the wings, preceded by an interrupted line. Under surface whitish grey, a blackish discal spot and dark central line on each wing.

Expanse, ♂ 64-74, ♀ 83 millim.

One male specimen and two females from Moupin and a male from Omei-shan, July.

Hab. Western China.

Allied to *B. recursaria*, Walk., but distinguished by the form of the transverse lines, and also by the rusty-brown markings.

Biston recursaria.

Boarmia recursaria, Walk. Cat. Lep. Het. xxi. p. 374 (1860).

Amphidasys superans, Butl. Ill. Typ. Lep. Het. ii. p. 48, pl. xxxv. fig. 3 (1878).

Biston recursaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 246 (1895.)

Several specimens in Pryer's collection.

I captured examples at Nagasaki in May and at Shimonoseki in July. My collectors in Western China obtained one female specimen at Ta-chien-lu and another at Wa-shan, both in June.

Distribution. Sikhim; Khâsis; Bassein; Burma; Java (*Hampson*); Japan; Kiushiu; Western China.

- *Biston invenustaria.*

Amphidasys invenustaria, Leech, Entom., Suppl. p. 43 (May 1861).

Allied to *B. recursaria*, Walk.

Several specimens from Oiwake in Pryer's collection.

- *Var. sinicaria*, nov.

Differs from the type in having the transverse lines blacker and the bands browner; between the second and submarginal lines there are some brownish clouds.

In one female specimen the black lines are absent.

My collectors obtained examples of this form at Wa-shan, Pu-tsu-fong, Ni-tou, Chia-ting-fu, Chia-kou-ho, Chang-yang.

Distribution. Japan; Central and Western China.

— *Biston suppressaria*.

Amphidanyx suppressaria, Guen. Phal. i. p. 210 (1857).

Buzura multipunctaria, Walk. Cat. Lep. Het. xxvi. p. 1531 (1862).

Buzura strigaria, Moore, Lep. Ceyl. iii. pl. clxxxviii. figs. 1, 1 a, b, c (larva) (1887).

Biston suppressaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 247 (1895).

Two male specimens and one female from Omei-shan, and one female from Wa-shan : June.

The female example from Omei-shan is more heavily powdered with black than the other specimens, and consequently looks much darker.

There is a specimen from Japan in the National Collection at South Kensington.

Distribution. Kángra ; Sikhim ; Assam ; Calcutta ; Ceylon ; Japan (*Hampson*) ; Western China.

— *Biston tibetaria*.

Amphidanyx tibetaria, Oberth. Etud. d'Entom. xi. p. 32, pl. v. fig. 30 (1886).

Specimens have been received from Chang-yang, Ichang, Ta-chien-lu, Ni-tou, and Chia-ting-fu : June and July.

Oberthür's type was taken by M. Biet at Chápa.

Distribution. Central and Western China.

Genus MEGABISTON.

(Warren, Novit. Zool. i. p. 429 (1894).)

Megabiston plumosaria.

Biston plumosaria, Leech, Entom., Suppl. p. 43 (May 1891).

Megabiston plumosaria, Warren, Novit. Zool. i. p. 429 (1894).

There was a fine series from Yokohama in Pryer's collection.

Hab. Japan.

Genus MEGAMETOPON.

(Alphéraky, Rom. sur Léop. vi. p. 58 (1892).)

Megametopon piperatum.

Megametopon piperatum, Alph. Rom. sur Léop. vi. p. 58, pl. iii. fig. 3, ♂ (1892).

Alphéraky records this species from Tchín-Tassy, in the Province of Kan-sou : July.

Genus ELPHOS.

(Guen. Phal. i. p. 285 (1857).)

— *Elphos insueta*.

Elphos insueta, Butl. Ill. Typ. Lep. Het. ii. p. 48, pl. xxxvi. fig. 2 (1878).

A few specimens from Ohoyama, Oiwake, and Fujisan in Pryer's collection.

Mr. Smith took one example at Hakone in August, and my collectors one at Moupin in July.

The Chinese specimen differs from Japanese examples in the much fainter colour of the yellow markings.

Distribution. Japan and Western China.

Genus XANDRAMES.

(Moore, Proc. Zool. Soc. Lond. 1867, p. 634.)

Xandrames sericea.

Xandrames sericea, Butl. Trans. Ent. Soc. 1881, p. 409.

Xandrames latiferaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 250 (1895).

Several specimens from Fujisan and Nikko, confounded with *X. latiferaria*, in Pryer's collection.

My native collector captured some specimens at Hakodate in June or July. I have also received the species from Chang-yang, Moupin, Chia-ting-fu, and Ta-chien-lu: June and July.

I cannot agree with Hampson in regarding *X. sericea*, Butl., as synonymous with *X. latiferaria*, Walk. The two insects appear to me to be very distinct, especially as regards the markings of secondaries. Hampson's figure represents *X. sericea*, and not *X. latiferaria*; the latter is well figured by Butler (Ill. Typ. Lep. Het. iii. pl. xlix. fig. 11).

Distribution. Japan; Yesso; Central and Western China.

Xandrames latiferaria.

Pachyodes? latiferaria, Walk. Cat. Lep. Het. xxi. p. 445 (1860).

Elphos latiferaria, Butl. Ill. Typ. Lep. Het. iii. p. 36, pl. xlix. fig. 11 (1879).

One male specimen from Oiwake in Pryer's collection.

I captured a male at Hakodate in August, and I have specimens from Omei-shan, where they were taken in July and August, and others from Kiukiang.

Distribution. Japan; Yesso; Central and Western China.

Xandrames xanthomelanaria.

Xandrames xanthomelanaria, Pouj. Ann. Soc. Ent. Fr. 1895, p. 309, pl. vi. fig. 6.

Poujade records a male specimen from Moupin. I have an example of the same sex from Omei-shan, and one from Chia-kou-ho, taken in July.

Hab. Western China.

This species is allied to *X. sericea*, Butl., and *X. latiferaria*, Walk., most nearly perhaps to the former. It is, however, at once separated from either by the shape of the fascia on primaries and yellow border on secondaries.

Xandrames agitata.

Boarmia agitata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 396 (1878);

Ill. Typ. Lep. Het. iii. p. 33, pl. xlviii. fig. 9 (1879).

Dulophyle agitata, Warren, Novit. Zool. i. p. 432 (1894).

Some specimens from Ohoyama and Nikko in Pryer's collection.

Mr. Smith took the species at Hakone in August, and there are specimens in the National Museum from Tokio, Yokohama, and Chiuzenji.

Hab. Japan.

— *Xandrames angustaria*, sp. n.

Primaries ochreous, mottled and striated with dark brown; there is a fuliginous patch at the base; a subbasal band and a broad central fascia of the same colour, the latter interrupted in the middle and bordered outwardly on the costa by a patch of the ground-colour enclosing a dark irregular bar; sub-marginal line interrupted, preceded by some dark clouds below costa. Secondaries fuscous, finely striated with cupreous brown; there is a dusky discal dot and central line. Fringes of the ground-colour marked with fuliginous. Under surface fuscous, paler along costa of primaries; there is an irregular-shaped pale fascia beyond the middle of the wing enclosing a dark patch below costa; discal dot black.

Expanse 54 millim.

One specimen from Omei-shan, June.

Hab. Western China.

Genus GNOPHOS.

(Treitschke, Eur. Schmelt. vi. p. 160 (1827).)

— *Gnophos muscosaria*.

Gnophos muscosaria, Walk. Cat. Lep. Het. xxxv. p. 1596 (1866).

Gnophus muscosarius, Hampson, Fauna Brit. Ind., Moths, iii. p. 251 (1895).

One female specimen from Moupin taken in July.

Distribution. N.W. Himalayas; Sikhim (Hampson); Western China.

— *Gnophos approximaria*, sp. n.

Greyish, powdered and marked with dark brown. Primaries have four transverse wavy lines and a transverse basal

shade: the first line is slightly indented below costa; the second is placed a little beyond the black discal spot and is closely followed by the third; this last is edged outwardly with whitish, and is nearer to the second on the inner margin than on the costa; the fourth (submarginal) is pale, preceded by a dark brown cloud towards costa and also towards inner margin. Secondaries have two wavy lines hardly traceable towards costa but terminating near together on the middle of abdominal margin; there is a short diffuse bar near anal angle. Fringes brownish, preceded by a black line. Under surface brownish grey; all the wings have a blackish discal spot and indistinct wavy central line.

Expanse, ♂ 50, ♀ 50-56 millim.

One male specimen and five females from Pu-tsu-fong, July.

As the male is not in good condition, I have described a female as the type; but the sexes do not appear to differ in markings.

Hab. Western China.

— *Gnophos pullata*.

Gnophos pullata, Treit. Schm. vi. p. 170 (1827).

Pseudopanthera pullata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 117.

One male specimen, taken at How-kow in July, appears to be referable to this species.

The wings are dark grey, tinged with brownish as far as the second line on primaries and the central line on secondaries. The under surface is also darker. In some respects this specimen seems to agree with var. *confertata*, Staud. (Cat. p. 167) = var. *a*, Guen., from Styria.

— *Gnophos minutaria*, sp. n.

Male.—Basal two-thirds of all the wings ochreous grey, irrorated with dark grey and limited by a serrated dark grey line which is followed by a whitish band; outer marginal area ochreous grey, clouded with dark grey and traversed by a whitish band; discal spot whitish, surrounded with dark grey. Fringes whitish grey, preceded by an interrupted black line. Under surface pale greyish; primaries suffused with fuscous, traversed by an ill-defined pale band; secondaries have a curved dusky band.

Female.—Similar to the male, but the dark grey clouding is less distinct.

Expanse, ♂ 24, ♀ 30 millim.

One male specimen from Pu-tsu-fong and one female from Moupin, July.

Hab. Western China.

Very similar to *G. variegata*, Dup., on upper surface, but on the underside there is no heavy black marking on the outer margins.

— *Gnophos lentiginosaria*, sp. n.

Male.—All the wings white, heavily freckled and clouded with fuliginous grey. The primaries have a blackish patch on the costa extending to and enclosing the black discal spot; a smaller spot of the same colour lies between this patch and the base of the wing and a larger one beyond it, from which an interrupted narrow blackish band proceeds across the wing to the inner margin; just beyond this line is a large rather round blackish spot. Secondaries have a blackish discal spot. Fringes fuliginous grey, marked with white but hardly chequered, and preceded by a blackish line. Under surface of all the wings white; primaries are fuliginous grey on basal area, and a broad streak of the same colour extends to a break in the fuliginous-grey border of outer margin; the costa is narrowly ochreous and has three blackish spots on it, the second of these extends to the discal spot, and the third gives rise to a narrow blackish band, which crosses the wing almost to the submedian nervure: secondaries have the costa narrowly striated with dark grey, a blackish discal spot, and six or seven blackish spots forming a curved series from costa to inner margin. Antennæ simple. Head blackish. Thorax corresponds with the wings. Abdomen above greyish, marked with ochreous on the segmental divisions; entirely ochreous beneath; the legs also are greyish above and ochreous beneath.

Female.—Rather more ample in the wing, but colour and marking similar to the male.

Expanse 47–52 millim.

A nice series, comprising specimens from Ta-chien-lu, Pu-tsu-fong, Ni-tou, Moupin, and Omei-shan, the majority from the last-named locality: June and July.

Hab. Western China.

— *Gnophos accipitraria*.

Gnophos accipitraria, Guen. Phal. i. p. 300 (1857).

Gnophus accipitrarius, Hampson, Fauna Brit. Ind., Moths, iii. p. 252 (1895).

One female specimen from Omei-shan and one from Moupin, May.

Distribution. N.W. Himalayas; Shillong; Sibságar, Assam (*Hampson*); Western China.

Gnophos lichenea.

Gnophos lichenea, Oberth. Etud. d'Entom. xi. p. 33, pl. v. fig. 33 (1886).

Gnophus licheneus, Hampson, Fauna Brit. Ind., Moths, iii. p. 253 (1895).

I have a long series, comprising both sexes, from Pu-tsu-fong, Moupin, Omei-shan, and Chang-yang: July.

Oberthür received the species from Tâ-t sien-Loû.

Distribution. Sikhim (Hampson); Western and Central China.

Gnophos theuropides.

Gnophos theuropides, Oberth. Etud. d'Entom. xv. p. 22, pl. iii. fig. 28 (1891).

Nine male specimens from Pu-tsu-fong and one example of the same sex from Moupin: June and July.

Oberthür records specimens from Tâ-t sien-Loû, captured by Mgr. Biet.

Hab. Western China.

Gnophos incolarìa, sp. n.

Male.—Whitish grey. Basal half of primaries and the outer marginal area darker, the former traversed by an indistinct band of the paler ground-colour, in which there are some darker marks, and the latter intersected by a wavy line of the ground-colour; the whitish-grey area between these dark portions is clouded on the costa and inner margin, and is traversed by a wavy black line. Secondaries have the outer marginal area dark grey intersected by a paler wavy line and limited by a wavy black line; the remainder of the wing is sprinkled with dark grey scales; discal spots black. Fringes rather brownish grey. Under surface white, with black discal spots; basal area of primaries sprinkled with greyish, and the whole of the outer marginal area, except the apex, of primaries is dark grey; the secondaries have a dark grey submarginal band, and the lower two-thirds of the area beyond is sprinkled with dark-grey scales; fringes white, marked with brownish grey at the extremities of the nervules. Antennæ bipectinated.

Expanse 50 millim.

Two male specimens from Kwei-chow, June.

Hab. Western China.

Allied to *G. eolaria*, Guen.

Gnophos eolaria.

Gnophos eolaria, Guen. Phal. i. p. 204.

Gnophus eolarius, Hampson, Fauna Brit. Ind., Moths, iii. p. 253 (1895).

Two male specimens from Kwei-chow and one example of each sex from How-kow, July.

One of the examples from Kwei-chow is whitish grey, suffused with ochreous brown; the other is greyish, irrorated with pale brownish on the basal area of all the wings. The How-kow male is brownish grey, and the female is similar but more brownish on submarginal area.

Distribution. Himalayas; Punjaub; Khásis (*Hampson*); Western China; Thibet.

Gnophos mandarinaria, sp. n.

Whitish, striated and mottled with grey and tinged with ochreous on lower half of primaries and submarginal area of secondaries; a black discal spot on all the wings. The first line on primaries, which is slightly curved and rather wavy, commences as a spot on the costa and is marked with black on the nervures; the second line is serrated, slightly curved, and marked with black on the nervules; between these lines, but nearer the second, there is a dark fascia-like shade; submarginal line whitish, with a grey cloud before it at the costa, another just below, and a third on inner margin. Secondaries have a dark grey serrated central line, edged externally with whitish and preceded by a dusky shade; submarginal line as on primaries. Fringes grey, preceded by a series of black spots placed on a black line. Under surface of primaries brownish fuscous, paler on the margins, and of secondaries ashy; all the wings have a small discal spot and indications of a central line.

Expanse 44-50 millim.

Three male specimens from Wa-shan, June.

Hab. Western China.

This species is allied to *G. serotinaria*, Hübn. It varies in the intensity of the grey mottling.

— *Gnophos punctivenaria*, sp. n.

Male.—Whitish, powdered with brownish grey. The first and second transverse lines on primaries are greyish, their course indicated by black dots on the nervures and nervules respectively; the second line is preceded and followed by an olive-brown band which together with the dotted transverse line give the appearance of a fascia; the submarginal line is pale but indistinct, and is preceded by some olive-brown cloud-like patches. Secondaries have a serrated black central line becoming indistinct towards costa, preceded by an olive-brown shade; beyond there is an inwardly olive-brown bordered pale submarginal line; all the wings have a black discal spot.

Fringes brownish grey, preceded by a series of black elongated spots. Under surface of primaries fuscous with paler margins, and of secondaries greyish; blackish discal spot on all the wings, and the second line of primaries is indicated on the nervules. Antennæ more than half the length of primaries, bipectinated.

Female.—Rather browner, and the submarginal line on all the wings appears more distinct.

Expanse, ♂ 52, ♀ 46 millim.

I have specimens from Moupin, Ta-chien-lu, Wa-shan, Pu-tsu-fong, and Che-tou, taken in May and June.

Hab. Western China.

This species is subject to variation in tint and in the definition of the markings. Some examples are greyer than the specimens I have selected as types, and in others the markings are somewhat confused, but the black dots on the neuration appear to be a constant character.

— *Gnophos lilliputata*.

Gnophos lilliputata, Pouj. Ann. Soc. Ent. Fr. 1895, p. 308, pl. vi. figs. 7, 7 a.

One example of each sex recorded from Moupin by Poujade.

Hab. Western China.

— *Gnophos* (?) *thibetaria*.

Gnophos thibetaria, Oberth. Etud. d'Entom. ix. p. 21, pl. i. fig. 3 (1884).

Oberthür refers to the type as a very fresh female specimen which was taken by Mgr. Biet at Ta-tsien-Loû.

The figure of this species does not seem to exhibit the characters of a *Gnophos*.

Gnophos gnophosaria.

Psodos gnophosaria, Oberth. Etud. d'Entom. xviii. p. 28, pl. iii. fig. 45 (1893).

Judging from the figure, I should say that this species is referable to *Gnophos*, and appears to be a close ally of *G. obscuraria*, Hübn., if it is not really a form of that species, from which it only appears to differ in the more pronounced character of the transverse line on under surface of the wings.

Hab. Western China.

* *Gnophos* (?) *creperaria*.

Gnophos creperaria, Ersch. Hor. Soc. Ent. Ross. xii. p. 337 (1876); Hedem. op. cit. xvi. p. 247, pl. xiii. fig. 3 (1881).

Gnophos ? *creperaria*, Alph. Rom. sur Léop. vi. p. 63 (1892).

Alphéraky records a specimen, taken in September, at Youï-line-tchouan in the Province of Kan-sou, Western China, which he considers to be the female of *G. creperaria*, Ersch. Græser also records the species from Amurland.

Distribution. Siberia; Amur; Western China.

Gnophos fumosa.

Cutascia fumosa, Warren, Novit. Zool. ii. p. 120 (1895).

Hab. Japan.

I have been unable to examine the type of this species.

Gnophos (?) exculpta.

Tephrosia exculpta, Butl. Trans. Ent. Soc. Lond. 1881, p. 408.

There were two female specimens from Yokohama and Oiwake in Pryer's collection. I have received two examples of each sex from Ta-chien-lu, and a female from Ni-tou: June and July.

Var. brunnearia, var. nov.

This form, of which I have only a male example from Omei-shan, differs from the type in its smaller size, pale brown ground-colour, and blackish blotch above outer angle of primaries; the indented marginal line of primaries is absent.

Distribution. Japan; Western China.

Genus BYLAZORA.

(Walk. Cat. Lep. Het. xxvi. p. 1540 (1832).)

Bylazora nigropunctaria, sp. n.

Primaries olive-green, marked with black at the base and on the neuration; there is a transverse line before the middle and one beyond the middle, each represented by black dots on the nervures and nervules, the dots in the first series are edged inwardly and those in the second series outwardly with whitish; submarginal line whitish, angled towards costa and curved towards inner margin, and followed by an interrupted and irregular black band; discal spot black, oval, enclosing a line of the ground-colour; fringes of the ground-colour, preceded by a series of whitish-edged black lunules. Secondaries whitish, freckled with fuscous grey; fringes brownish grey, preceded by a series of pale-edged blackish lunules. Under surface pale whitish brown, freckled with fuscous; all the wings have a blackish discal mark and a transverse series

J. H. Leech on *Lepidoptera Heterocera*

lots beyond; primaries are suffused with fuscous and have an interrupted blackish submarginal

12 millim.

specimen from Pu-tsu-fong, June.
Western China.

B. pilicostata, Walk.

Genus OPTHALMODES.

(Guen. Phal. i. p. 283 (1857).)

Ophthalmodes ocellata.

Boarmia ocellata, Leech, Trans. Ent. Soc. Lond. 1880, p. 143, pl. ix. fig. 11.

Diastictis saturniaria, Græs.; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 104.

Seven fine specimens from Oiwake in Pryer's collection.

I received specimens from Kiukiang, Ichang, Chang-yang, Moupin, Omei-shan, Wa-shan, and the Province of Kwei-chow: May, June, and July. In the National Collection there is a specimen labelled from Ningpo.

The Japanese specimens are rather whiter in ground-colour than the Chinese.

Distribution. Japan; Central, Western, and North-eastern China.

Meyrick appears to consider *ocellata* to be synonymous with *saturniaria*, Græs., but from the description alone of the latter it is rather difficult to decide upon this point.

Ophthalmodes herbidaria.

Ophthalmodes herbidaria, Guen. Phal. i. p. 283 (1857); Moore, Lep. Ceyl. iii. p. 417, pl. exci. fig. 4, ♀ (1887).

Ophthalmodes diurnaria, Guen. l. c. p. 284.

Boarmia pertusaria, Feld. Reise Nov. pl. cxxv. fig. 17, ♂ (1874).

I have specimens from Chang-yang, Omei-shan, and the Province of Kwei-chow: July.

Distribution. N.W. and E. Himalayas; Assam; Ceylon (*Hampson*); Central and Western China.

Ophthalmodes cordularia.

Ophthalmodes cordularia, Swinh. Ann. & Mag. Nat. Hist. (6) xii. p. 155 (1893); *Hampson*, Fauna Brit. Ind., Moths, iii. p. 256 (1895).

One specimen from the Province of Kwei-chow, taken in July. This agrees with *O. cordularia*, Swinh., but, except that it has black palpi, is almost identical with *O. herbidaria*, Guen.

Distribution. Sikhim; Khâsis (*Hampson*); Western China.

— *Ophthalmodes senex*.

Bourmia senex, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 306 (1878); Ill.

Typ. Lep. Het. iii. p. 34, pl. xlix. fig. 3 (1879).

Boarmia hedemanni, Christ. Bull. Mosc. Iv. (2) p. 79 (1881).

Diastictis senex, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 103.

Some nice specimens from Yokohama in Pryer's collection.

I captured the species at Gensan in July, and it was obtained by my collectors at Chang-yang and most of the localities in Western China that they visited.

The species seems to vary a good deal in size and also in the ground-colour, but this last may probably be due to condition.

Distribution. Amur; Corea; Japan; Central and Western China.

Ophthalmodes subpicaria, sp. n.

White, sparingly dusted with brownish, especially along the nervures and inner margins. Primaries have four equidistant brownish spots on costa; the fourth near apex and limiting, at that point, a broad greyish band on outer margin, which is interrupted about the middle, clouded with brownish above and below the interruption, and intersected by a whitish wavy line commencing in external edge of fourth costal spot, and terminating at inner angle. Secondaries have a dusky central spot, a curved series beyond, each spot placed on a nervule (a similar series of spots is present on primaries, but not so well defined); the outer margin is clouded with brownish towards both angles. Fringes brownish, faintly chequered with grey, and preceded by an interrupted black line. Under surface: primaries white, clouded with blackish on the costal portion of basal area and before apex; there is also a lesser cloud on the outer margin just above anal angle; discal spot black and conspicuous, showing through on upper surface; costa marked with black and dusky: secondaries have two black spots on costa, with some streaks of the same colour between them and towards the base of the wing; submarginal band blackish, interrupted about the middle and terminating before inner margin. Antennæ blackish; bipectinated in the male.

Expanse, ♂ 68, ♀ 72 millim.

One example of each sex from Omei-shan, and one male from Chang-yang: June.

Hab. Central and Western China.

Genus BUPALUS.

(Leach ; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 107.)

Bupalus mirandus.*Bupalus mirandus*, Butl. Trans. Ent. Soc. Lond. 1881, p. 599.

Butler's type from Yokohama is a male. The female is ferruginous brown in colour, and the white markings are not quite so broad as in the male.

There was an example of each sex in Pryer's collection.

Hab. Japan.

Bupalus (?) *dauidaria*.

Fidonia dauidaria, Oberth. Etud. d'Entom. vi. p. 18, pl. ix. fig. 4 (1881).

Oberthür's type is a female taken in the north of China by M. l'Abbé Armand David. I have not seen an example of the species.

Genus NARRAGA.

(Walk. ; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 107.)

Narraga fasciolaria.

Fidonia fasciolaria, Rott. var., Alph. Rom. sur Léop. vi. p. 64 (1892).

Narraga fasciolaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 107.

Alphéraky records one female example of a form of this species from the Province of Chan-si, North-western China.

Distribution. Europe ; Altai ; Ural ; Amur ; North-western China.

— Genus SELIDOSEMA.

(Hübner. Verz. Schmett. p. 299.)

— *Selidosema catotæniaria*.

Selidosema catotæniaria, Pouj. Ann. Soc. Ent. Fr. 1895, p. 313, pl. vii. figs. 15, 15 a.

Poujade's type was from Moupin ; I received specimens from that locality and also from Ta-chien-lu and Chang-yang, taken in June.

— *Var. restrictaria*.

In this form the patches do not extend to the margins and the band on the secondaries is considerably restricted in width.

A male specimen from Wa-shan and a female from Chang-yang, June.

Hab. Central and Western China.

Selidosema sordida.

Selidosema sordida, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 406 (1878);
Ill. Typ. Lep. Het. iii. p. 46, pl. lii. fig. 7 (1879).

A fine series from Ohoyama, Nikko, and Oiwake in Pryer's collection. My native collector obtained the species at Hakodate in June.

Hab. Japan and Yesso.

Genus *TEPHROSIA.*

(Boisd. Ind. p. 198 (1840).)

Tephrosia luridata.

Geometra luridata, Bork. v. p. 235 (1794); Zell. Stett. ent. Zeit. 1853, p. 414.

Geometra extersaria, Hübner. Geom. fig. 159 (post 1797).

Tephrosia extersaria, Boisd. Ind. p. 198 (1820).

Ectropis luridata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 104.

There were a few specimens from Oiwake in Pryer's collection.

My native collector took the species at Hakodate in June.

Japanese specimens are rather smaller than European examples; they are also more thickly powdered with brownish, and the pale spot on outer marginal area of primaries is of less size.

Distribution. Europe; Amur; Japan.

Tephrosia costipunctaria.

Tephrosia costipunctaria, Leech, Entom., Suppl. p. 47 (May 1891).

There were three specimens of each sex from Oiwake in Pryer's collection.

Allied to *T. luridata* and also to *T. punctularia* from Europe, but it is not likely to be confused with either of those species.

Hab. Japan.

- *Tephrosia biundularia.*

Geometra biundularia, Bork. Eur. Schmett. v. p. 162 (1794).

Geometra crepuscularia, Hübner. Geom. pl. xxx. fig. 158.

Tephrosia crepuscularia, Guen. Phal. i. p. 268.

Ectropis biundularia, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 104.

Boarmia crepuscularia, Hampson, Fauna Brit. Ind., Moths, iii. p. 260 (1895).

Boarmia nikkonis, Butl. Trans. Ent. Soc. Lond. 1881, p. 406.

Tephrosia excellens, Butl. Ann. & Mag. Nat. Hist. (5) xiii. p. 275 (1884).

There were several specimens from Nikko and Yesso in Pryer's collection. I took the species at Ningpo in April;

Ann. & Mag. N. Hist. Ser. 6. Vol. xix.

at Nagasaki and in Satsuma in May; at Nagasaki, Tsuruga, and Gensan in July; at Hakodate in August. My native collector met with it in the island of Kiushiu.

I have also received a number of specimens from the various localities visited by my collectors in Central and Western China.

This species varies considerably in size both in China and Japan. The smallest specimen is only 26 millim. in expanse, whilst the largest measures 58 millim.

Nikkonis, Butl., is a strongly-marked example of the type form, and although rather larger is not otherwise different in any material respect from specimens I have seen from Scotland.

Excellens, Butl., is an unusually large form of the species; I have examples of it from Japan and Yesso.

Distribution. Europe; Amur; Corea; Japan; Central and Western China. N.W. Himalayas; Sikhim and Khâsis (*Hampson*).

Tephrosia griseascens.

Ectropis griseascens, Warren, Novit. Zool. i. p. 434 (1894).

Probably a form of *T. biundularia*.

The types are from China and Japan.

- *Tephrosia pongaria.*

Tephrosia pongaria, Oberth. Etud. d'Entom. xviii. p. 27, pl. iv. fig. 53 (1893).

Recorded by Oberthür from Tâ-tsiên-Loû (Ta-chien-lu).

I received two specimens from Moupin, where they were captured in June.

Hab. Western China.

Tephrosia punctularia.

Geometra punctulata, Hübner, Geom. fig. 317.

Boarmia punctulata, Dup. vii. pl. clxiii. fig. 5.

Tephrosia punctulata, Guen. Phal. i. p. 269.

Ectropis punctularia, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 104.

Tephrosia ignobilis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 397 (1878);

Ill. Typ. Lep. Het. iii. p. 35, pl. xlix. fig. 6 (1879).

There were specimens from Gifu and Yesso in Pryer's collection.

I obtained the species at Ningpo in April, and at Yokohama and Nagahama in June.

T. ignobilis, Butl., cannot be specifically separated from *T. punctularia*. The figure given in 'Illustrations' is not good.

Distribution. Europe; Siberia; Amur; Japan; Yesso; North-eastern China.

Tephrosia pygmaea, sp. n.

Whitish, striated with yellow on outer half of all the wings. Primaries clouded with blackish on basal area; subbasal band represented by an upright blackish dash on inner margin, a cloud on costa; beyond the black discal spot there is a curved and recurved blackish band, followed by a curved series of blackish dots, which coalesce with the band towards inner margin; submarginal band blackish, twice interrupted and separated from an interrupted marginal band by a transverse line of the ground-colour. Secondaries clouded and spotted with blackish on basal area; submarginal and marginal bands as on primaries. Fringes yellow chequered with black. Under surface similar to above.

Expanse 20-24 millim.

Two male specimens from Chang-yang, June and July.

Hab. Central China.

- Tephrosia brunnea, sp. n.

Male.—Grey-brown, powdered with dark brown. Transverse lines of primaries dark brown and rather wavy; the inner is slightly elbowed below costa and thence oblique to inner margin; the outer is elbowed below costa and thence oblique to just above the inner margin, where it is slightly angled; between these lines there is a curved black discal spot and a dusky central line, the upper portion of the latter touches the extremities of the curved spot, forming together an annulated mark; beyond the second line the wing is clouded with dark brown and traversed by a whitish line. Secondaries have a slightly curved wavy brown outer line and an oblique brown band between it and the base of the wing; the area beyond the outer line is clouded with brown and intersected by a whitish line. Fringes agree in colour with the wings, but are rather darker at the ends of the nervules. Under surface ochreous, slightly powdered with brown scales, whitish along inner margin of primaries; lines brown as above, but faint; discal spot of primaries large, blackish; some dusky clouds on the outer marginal area of the wing. Antennae finely ciliated.

Female less powdered with dark brown; transverse lines more distinct.

Expanse, ♂ 34, ♀ 32 millim.

A long series from Ichang and Chang-yang: June, July, and August. One male specimen from Moupin and one from Omei-shan, July.

Hab. Central and Western China.

Tephrosia noctivolens.

Tephrosia noctivolens, Butl. Trans. Ent. Soc. 1881, p. 598.

A fine series in Pryer's collection. The specimens are from Oiwake and Gifu, but chiefly from the former locality. Fenton obtained it at Tokio.

Hab. Japan.

Tephrosia (?) tindzinaria.

Tephrosia tindzinaria, Oberth. Etud. d'Entom. xviii. p. 26, pl. v. fig. 75 (1893).

Recorded by Oberthür from Tâ-tsien-Loû (Ta-chien-lu).

My collectors did not obtain this species, which, judging from the figure, is probably referable to *Cidaria*.

Hab. Western China.

Tephrosia (?) tamarica.

Tephrosia tamarica, Oberth. Etud. d'Entom. xviii. p. 26, pl. v. fig. 78 (1893).

Oberthür describes this species from specimens received by him from Tâ-tsien-Loû (Ta-chien-lu).

I have not seen an example, but from the figure I should consider that it is probably referable to *Cidaria*.

Hab. Western China.

Genus *BOARMIA*.

(Treitschke, Eur. Schmett. v. p. 433 (1825).)

Boarmia farracearia, sp. n.

Slaty grey, mottled and powdered with whitish; the most conspicuous of these pale marks on the primaries are a large patch on the costa enclosing the discal spot, one at apex, and a third about the middle of the outer margin; all these markings are more or less powdered with grey; there are three dark transverse lines or bands, but these are not well defined; submarginal line white and sharply serrated. Secondaries have two indistinct blackish transverse bands and a black discal spot; submarginal line as on primaries. Fringes white and dark grey, spotted with black at their base. Under surface whitish: primaries have the costa dusky and a deep blackish band on outer margin, spotted with whitish at apex and on the middle; secondaries have a broad blackish antemarginal band; all the wings have a black discal spot and central line.

Expanse 42-46 millim.

Five female specimens and one male from Wa-shan, Ta-chien-lu, Chow-pin-sa, and Chia-ting-fu; and one example of each sex from Moupin: June and July.

These eight specimens exhibit a good deal of variation in the amount of white: one example might be described as having the primaries whitish, with dark grey basal patch and broad submarginal band; this specimen, however, is rather worn. In two others the primaries are shorter and the outer margin rounder than in the type.

— *Var. fuliginaria*.

Entirely suffused with fuliginous; submarginal line pale and conspicuous.

One male specimen from Ichang, June.

Hab. Central and Western China.

— *Boarmia duplexa*.

Cleora duplexa, Moore, Lep. Atk. p. 239 (1887).

Boarmia duplex, Hampson, Fauna Brit. Ind., Moths, iii. p. 258 (1895).

One male specimen from Pu-tsu-fong, and a female from Omei-shan: July.

Distribution. Nepal; Sikhim (*Hampson*); Western China.

— *Boarmia nigrilinearia*, sp. n.

Primaries ochreous grey, tinged with violaceous and irrorated with blackish; first line black, curved, preceded by a transverse blackish shade; second line black, sinuous, followed by a cupreous band-like shade; submarginal line blackish, wavy, most distinct towards costa; discal dot black. Secondaries grey, suffused and mottled with fuscous on discal area, the abdominal margin irrorated with blackish and marked with ochreous towards anal angle; central line blackish but rather obscure. Fringes grey, marked with fuscous, and preceded by an interrupted blackish line. Under surface grey, suffused and irrorated, especially on secondaries, with fuscous; all the wings have a dusky discal dot and central line; primaries have traces of a submarginal line most distinct towards the costa.

Expanse 84 millim.

One male specimen from Kia-ting-fu, June.

Hab. Western China.

— *Boarmia lenticularia*, sp. n.

Primaries whitish, dusted with black and clouded with olivaceous; there is a black spot at the base; first transverse

line slightly indented; second line dentate, curved from below costa to above inner margin; submarginal line black, interrupted and indistinct; discal spot elongate. Secondaries whitish, freckled with brownish; discal spot black; central line blackish, interrupted. Under surface whitish, freckled with brown; the transverse markings of upper surface faintly reproduced on all the wings.

Expanse 34 millim.

One female specimen from Wa-ssu-kow, June.

Hab. Western China.

- *Boarmia recurvaria*, sp. n.

Primaries brown, rather reddish on inner marginal area, and clouded with black at the base; there are two black transverse lines: the first is elbowed below costa and then runs almost straight to inner margin, the second commences in a spot on costa above the elongate black discal spot and is then curved and recurved to inner margin; submarginal line brownish black, indented below costa, interrupted below the middle, and outwardly edged with pale brown; the space between first and second lines is rather tinged with grey, and its upper portion sprinkled with black scales; the outer marginal area is also sprinkled with black scales. Secondaries pale brown, freckled with fuscous, except on the upper portion of the outer marginal area; discal spot and central line black, from the middle of the former there is a short downward streak which gives the idea of a line running in the direction of the anal angle. Fringes concolorous with the wings, and preceded by a blackish line. Under surface pale brown, basal and outer third of primaries darker, discal spot black; secondaries freckled with fuscous as above; spot and line also as above. Antennæ ciliated.

Expanse 42 millim.

One male specimen from Pu-tsu-fong, July.

Hab. Western China.

- *Boarmia decoraria*, sp. n.

White, sparingly powdered with brown, more thickly on basal area, which is limited by a double blackish line indented below costa and above inner margin; there are indications of a central band most conspicuous on the costa; outer marginal area, limited by a curved and recurved blackish wavy line, has two brownish clouds on apical portion; submarginal line blackish, much interrupted and inwardly bordered with brownish. Secondaries have a blackish discal

dot, and the outer marginal area is marked similar to that of primaries. Fringes whitish, marked with brownish, and preceded by an interrupted black line. Under surface whitish, powdered with fuscous; all the wings have a black discal dot, an ill-defined dusky central shade, and a series of blackish dots beyond.

Expanse 25 millim.

A female specimen from Moupin, July.

Hab. Western China.

Boarmia tripartaria, sp. n.

Primaries brownish, with a broad whitish central band: first line curved; second line sinuous—these lines are black and there is blackish suffusion beyond the middle of the central band; there is a small blackish cloud on middle of costa. Secondaries greyish white, with a brownish, oblique, central line. Fringes brown and grey. Under surface greyish, freckled with darker: all the wings have dusky central lines. Antennæ finely ciliated.

Expanse 40 millim.

Two male specimens from Pu-tsu-fong, June.

Hab. Western China.

This species superficially resembles *Boarmia grisea*, Butl.

Boarmia lutearia.

Fidonia lutearia, Leech, Entom., Suppl. p. 50 (May 1891).

Three specimens from Oiwake in Pryer's collection.

Hab. Japan.

Boarmia petrosa.

Tephrosia petrosa, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 372 (1879).

Several specimens from Oiwake and one from Gifu in Pryer's collection.

I obtained the species at Tauruga in July. Pryer also records it from Ohoyama and Nikko, and there is an example from Hakodate in the National Collection at South Kensington.

Hab. Japan and Yesso.

Boarmia opertaria, sp. n.

Primaries greyish, freckled with blackish; basal and outer marginal thirds brownish, each limited by a blackish line; there is a central, blackish, transverse shade with the black discal spot upon it, this terminates on inner margin near to the limiting line of outer third; submarginal band of the

ground-colour, indistinct towards inner margin, and inwardly edged with fuliginous. Secondaries brownish, freckled and striated with blackish; the blackish discal spot is preceded by a blackish transverse band, and followed by a series of blackish dots representing a central line; submarginal line as on primaries but more obscure. Fringes pale brown, preceded by a black lunulated line. Under surface greyish brown, suffused on the disc with fuliginous; all the wings have two blackish transverse lines, with the discal spot upon the first one; costa of primaries pale ochreous brown, striated with blackish. Antennæ fasciculate.

Expanse 36 millim.

One male specimen in Pryer's collection, and I received one from Mr. Manley of Yokohama.

Hab. Japan.

Boarmia tristaria, sp. n.

Brownish grey. Primaries have fuliginous-brown sub-basal, central, and outer bands, the two latter approximating on inner margin: all these markings are repeated on secondaries. The submarginal line is whitish on all the wings, but not so well defined as in *B. mæsta*. Under surface pale ochreous brown powdered with darker, and suffused with the darker colour on primaries; discal spot black; outer line only reproduced. Antennæ fasciculate.

Expanse 44 millim.

Two male specimens from Kiukiang, June.

Hab. Central China.

This species agrees with *B. mæsta* in the style of marking, but the ground-colour is darker and without any tinge of purple. The antennæ also are fasciculated and not bipectinated as in *B. mæsta*. It belongs to the *Prochina* section of *Boarmia*, Hampson, as also does *B. opertaria*.

Boarmia charon.

Tephrosia charon, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 397 (1878); Ill. Typ. Lep. Het. iii. p. 35, pl. xlix. fig. 4 (1879).

A few specimens from Yokohama and Oiwake in Pryer's collection. I captured examples at Nagasaki in May.

One female specimen from Chang-yang, June.

Distribution. Japan; Kiushiu; Central China.

— *Boarmia conjunctaria*, sp. n.

Male.—Pale brown, heavily clouded and suffused with dark and rufous brown. Primaries have two black, wavy,

transverse lines and a dusky central transverse shade, the latter connected with second line just above inner margin; interrupted submarginal band of the ground-colour, bordered inwardly with fuliginous. Secondaries have a blackish subbasal band and an indistinct blackish central line; submarginal band as on primaries, but more deeply bordered with fuliginous. Fringes dark brown, paler at their base, and preceded by a lunulated black line. Under surface greyish brown; all the wings have a blackish discal dot and a series of short streaks indicating a transverse line beyond; outer margin of primaries bordered with fuliginous, especially towards apex. Antennæ fasciculate.

Female rather darker.

Expanse 42–44 millim.

One example of each sex from Ta-chien-lu, June.

Hab. Western China.

Superficially resembles *B. displicens*, Walk.; this and the preceding species belong to the subsection *Paradarisa* of Hampson's genus *Boarmia*.

– *Boarmia dilectaria*, sp. n.

Whity brown, heavily powdered and clouded with rufous brown, and finely striated with blackish. Primaries have the basal patch darker brown, limited by a double, wavy, blackish line originating in a dark quadrate spot on the costa; discal spot black, surmounted by a blackish spot on the costa; beyond there is a blackish transverse line, which is angulated below costa and again above inner margin; submarginal band represented by a dark cloud on costa, with one below it and an upright elongate patch from inner margin. Secondaries have a black discal spot; serrated blackish central line; submarginal band interrupted above the middle and indistinct towards costa. Fringes of the ground-colour, chequered with blackish, and preceded by a black lunular line. Under surface ochreous brown; markings of upper surface faintly indicated. Body dark brown. Antennæ fasciculated.

Expanse 50 millim.

One male specimen from Ta-chien-lu, June.

Hab. Western China.

– *Boarmia boarmiaria*.

Hypochroma boarmiaria, Guen. Phal. i. p. 282 (1857).

Boarmia inconclusa, Walk. Cat. Lep. Het. xxi. p. 382 (1860).

Boarmia boarmiaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 261 (1895).

One specimen from Kagoshima, in the province of Satsuma, in Pryer's collection.

Distribution. Formosa; Sikhim; Assam; Nágas; Ceylon (*Hampson*); Kiushiu.

Boarmia parvularia.

Tephrosia parvularia, Leech, Entom., Suppl. p. 47 (May 1891).

Two specimens of each sex from Gifu in Pryer's collection.

Hab. Japan.

This species is allied to *B. inceptaria*. Walk., which *Hampson* places in the *Psilalcis* section of *Boarmia*.

Boarmia Rybakowi.

Boarmia Rybakowi, Alph. Rom. sur Lép. vi. p. 61, pl. iii. fig. 4, ♂ (1892).

Alphéraky records this species from Ou-pin, province of Kan-sou, July.

— *Boarmia selenaria.*

Geometra selenaria, Hübn. Geom. fig. 163.

Ophthalmodon cretacea, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 373 (1879).

Boarmia selenaria, *Hampson*, Fauna Brit. Ind., Moths, iii. p. 264 (1895).

Ascotis selenaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 106.

There were four male and three female specimens in Pryer's collection.

I met with the species at Nagahama in June, and at Fushiki and Gensan in July.

I have also received the species from Ichang, Omei-shan, Ta-chien-lu, Chow-pin-sa, Chia-ting-fu: June and July. Alphéraky (Rom. sur Lép. vi. p. 60) records it from the province of Kan-sou, taken in September.

Distribution. N.W. Himalayas; Nepal; Khásis; Congo; S. Africa (*Hampson*); Europe; Altai; Amur; Corea; Japan; Central and Western China.

Boarmia sordida.

Ascotis sordida, Warren, Novit. Zool. i. p. 435 (1894).

Probably a small form of *B. selenaria*.

Hab. Corea.

Boarmia stipitaria.

Boarmia stipitaria, Oberth. Etud. d'Entom. v. p. 45, pl. iv. fig. 6, ♂ (1880); Gräser, Berl. ent. Zeit. 1888, p. 400.

Six male specimens and one female, from Oiwake and Yesso, in Pryer's collection. I captured one male example at Gensan in June.

The wings of this species are white, as Oberthür correctly describes them; but his figure represents a brownish-tinged insect.

Distribution. Askold; Amur; Japan; Corea.

Boarmia glabraria.

Geometra glabraria, Hübn. Geom. figs. 162, 339.

Cleora glabraria, Guen. Phal. i. p. 233.

Selidosema glabraria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 106.

There was one specimen in Pryer's collection, and I took two examples at Shikotan (Kurile Islands) in August. I have one female from the province of Kwei-chow, taken in July; this specimen has a rather broad border on outer margin of primaries.

Distribution. Europe; Japan; Kurile Islands; Western China.

Boarmia repandaria.

Phal. Geometra repandata, Linn. Syst. Nat. i. p. 866.

Boarmia repandaria, Treit., Guen. Phal. i. p. 238 (1857).

Selidosema repandata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 106.

Boarmia peripicuta, Moore, Proc. Zool. Soc. Lond. 1867, p. 630.

Boarmia trikotaria, Feld. Reis. Nov. v. pl. cxxvi. fig. 10 (1874).

Boarmia iterata, Butl. Proc. Zool. Soc. Lond. 1886, p. 889.

Aleis nudipennis, Warr. Proc. Zool. Soc. Lond. 1888, p. 320.

Boarmia repandata, var. *nobilis*, Alph. Rom. sur Lép. vi. p. 61 (1892).

Appears to be a common species in Central and Western China.

Some of the specimens are not separable in any way from more or less typical European examples. The majority, however, although modifications of the form, are referable to *trikotaria*, Feld. There are also specimens agreeing with *iterata*, Butl., on the one hand, and with *nudipennis*, Warr., on the other, and the connecting-links between these two forms are represented.

One specimen of the *iterata* form was taken by my native collector at Ningpo.

— Var. *obsoletaria*, nov.

Pale brownish grey; markings, with the exception of discal dots and obscure dark transverse lines, obsolete.

Four male specimens from How-kow, Thibet: July.

Distribution. Europe; Armenia; Altai; Siberia; Amur; N.W. India; Central, Western, and North-eastern China; Thibet.

Boarmia picata.

Boarmia picata, Butl. Trans. Ent. Soc. 1881, p. 408.

Three specimens from Oiwake in Pryer's collection; Butler's type was from Tokio.

I am inclined to think that *B. picata*, Butl., is only a form of *B. repandata*, but should like to see a larger number of specimens before giving a definite opinion.

The markings are, as regards colour, similar to those of *B. repandata*, var. *conversaria*, but they are transposed.

Hab. Japan.

Boarmia columbinaria, sp. n.

Basal half of primaries dark grey, its external edge clearly defined, dentated and marked with black on the costa and inner margin; beyond there is a large white patch, the costal portion of which increases in width as it approaches the inner margin; a wavy white line traverses this pale band from the white patch to inner margin, where it is most distinct; the outer marginal area is not quite so dark as the basal half of the wing, and about its middle there is an almost square pale patch; submarginal line whitish, bordered inwardly with dark grey. Secondaries have the basal third dark grey, clearly defined; outer third not so dark as the basal; the intermediate area is whitish, dusted with grey, most densely towards the outer area, and traversed by a narrow interrupted blackish band. Fringes pale grey, variegated with darker and preceded by a lunulated blackish line. Under surface fuliginous grey, with pale patches on central area, apex, and middle of outer margin of primaries; the basal two thirds of secondaries also pale. Antennæ bipectinated.

Expanse 48 millim.

One male specimen from Chang-yang, June.

Hab. Central China.

Boarmia secundaria.

Geometra secundaria, Hübner. Geom. pl. xxix. fig. 156.

Boarmia secundaria, Dup. Lép. iv. pl. clxii. fig. 2; Guen. Phal. i. p. 237.

Selidoesma secundaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 106.

Four specimens from Yokohama and Oiwake in Pryer's collection seem to be referable to this species. The transverse markings, however, are not so distinct, and the second line of primaries is less serrated.

This form may be known as var. *simpliciaris*.

Distribution. Europe; Japan.

Boarmia cinctaria.

Geometra cinctaria, Schiff. Wien. Verz. p. 101; Hübn. Geom. fig. 106.
Boarmia cinctaria, Treit. Schmett. vi. 1, p. 188; Dup. Lép. vii.
 pl. clix. figs. 2, 3.

Selidosema cinctaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 105.

Boarmia insolita, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 396 (1878);
 Ill. Typ. Lep. Het. iii. p. 34, pl. xlix. fig. 5 (1879).

There was a fine series from Oiwake and Yesso in Pryer's collection. My native collector took specimens at Hakodate in June.

Some of the specimens are identical with European examples, but others are of the pale form which Butler has described as *insolita*, a variety of *B. cinctaria*, which, according to Græser, also occurs in Amurland.

Distribution. Europe; Altai; Eastern Siberia; Amur; Japan; Yesso.

[To be continued.]

XXXII.—On a new Mouse from Damaraland.

By W. E. DE WINTON.

In a paper on a small collection of rodents made by Mr. C. J. Andersson in Damaraland, Mr. Oldfield Thomas (P. Z. S. 1882, p. 266) refers four specimens of a mouse to *Mus silaceus*, Wagn. This determination was found to be wrong by Mr. Thomas himself on visiting the Munich Museum some years later, when he was able to examine Wagner's type. As I have lately been working at the rodents of South Africa, Mr. Thomas very kindly asked me to look at these mice, giving me the benefit of his valuable notes and drawings of the skull of *Mus silaceus* made on the spot. I find the Damaraland mice belong to an undescribed species of a group of which I believe the form hitherto known is *Mus nigricauda* from the same locality and described in the paper referred to above.

The species may be known as

Mus damarensis, sp. n.

Size somewhat larger than *Mus sylvaticus*. Fur long and soft, of that peculiar colour usually associated with desert-living species. Colour above reddish fawn or isabelline, sparingly sprinkled with very fine darker hairs, the colour richest along the dorsal line, fading gradually into grey on the sides and cheeks, all the lower parts with the feet and hands pure white, the hairs being white to their bases. Ears

very large, covered inside and out with short reddish hairs. Whiskers long and numerous. Tail long, about equal in length to the head and body; the proximal half having short hairs of the same colour as the back; on the distal portion the fine silky hairs gradually lengthen till it may be called bushy; these longer hairs are almost liver-colour throughout. The scales, which are almost entirely concealed by the hair throughout the length of the tail, are exceedingly fine, about twenty to the centimetre. The feet are thick in the digital portion, the pads very large and rounded, entirely covering the fore part of the foot. The claws of both fore and hind feet are very small and curved, almost concealed by the hairs.

The actual locality of the type (B. M. no. 97. 2. 18. 1) is unknown, but one of the specimens is endorsed "Otjimbingue, Damaraland."

Measurements (taken from the skin):—

Head and body 135 millim.; tail 135* ; ear (relaxed) 20.5; hind foot (relaxed) 24.

The skull is chiefly remarkable in having extremely wide open infraorbital openings and very short snout. The supra-orbital ridges are well developed, but not beaded. The teeth are rather broad. The palate narrow and furrowed; the foramina extend back about half the length of m_1 , the back of the palate is even with the back of the molars.

Measurements:—Skull 31 millim.; br. 16; constr. 4.5; nasals 10.5×2.5 ; interpar. 4.5×9.5 ; hens. to back of pal. 13.1; pal. foram. 7.5; m_3 5.3; diastema 7.5; br. outside m_1 6, inside 2.5; mandible, length (bone only) 17, to tips of incisors 20, height 9.2.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

January 6, 1897.—Dr. Henry Hicks, F.R.S.,
President, in the Chair.

The following communication was read:—

1. 'On the Structure of the Skull of a Pliosaur.' By C. W. Andrews, Esq., B.Sc., F.G.S.

The paper deals with a specimen of the Plesiosaurian known as *Pliosaurus ferox*, Sauvage, obtained by Mr. A. N. Leeds from the Oxford Clay near Peterborough, and now in the British Museum.

* The tail of the type specimen being broken, this measurement is taken from another specimen (B. M. no. 81. 8. 3. 11) from the same locality of about the same size.

and perhaps the finest *Pliosaurus* skull known. It bears a great similarity to *Peloneustes philarchus*, but there are a number of differences which tend to show that the subject of the present communication is not the skull of an old individual of *Peloneustes*. Although the teeth of the fossil here described agree precisely with those described by Sauvage from the same horizon at Boulogne under the name *Liopleurodon ferox*, they differ considerably from those of the Kimeridge Clay upon which Owen founded the genus *Pliosaurus*; they, however, show a distinct tendency towards the typical form, and since the skull and skeleton of the Oxfordian and Kimeridgian forms are, so far as known, closely similar, the Author prefers for the present to follow the British Museum Catalogue in referring them both to one genus, *Pliosaurus*.

The Author gives a detailed description of the skull which forms the subject of the paper.

February 3, 1897.—Dr. Henry Hicks, F.R.S.,
President, in the Chair.

The following communication was read:—

1. 'The Subgenera *Petalograptus* and *Cephalograptus*.' By Miss G. L. Elles.

The forms referred to in the paper are accepted as subgenera of *Diplograptus*, as defined by Lapworth. The two subgenera have frequently been much confused, but examination of specimens preserved in relief shows that they have very distinctive characters, especially at the proximal ends. The Author gives diagnoses of the two subgenera, and detailed descriptions of the following forms:—*Petalograptus folium*, His.; *P. palmatus*, Barr., and varieties *latus*, Barr., *tenuis*, Barr., *ovato-elongatus*, Kurek; *P. ovatus*, Barr.; *P. n. sp.*; *Cephalograptus cometa*, Gein.; and *C. n. sp.*

She concludes that *Petalograptus* has been derived from *Orthograptus foliaceus*, *O. truncatus* having been a step on the way. The latter form has an almost horizontal connecting-canal, so that the first of the second series of hydrothecæ arises at nearly the same level as the first of the primordial series; whilst, if the connecting-canal became more oblique and the thecæ more concavely curved, a form identical with *P. palmatus* would be the result. Further changes would give rise to *P. n. sp.*, and subsequently to *P. folium*. When the first theca of the second series arises so late that the sicula is entirely free on the side remote from that on which the first of the primordial series arises, an important stage is reached, and the form becomes a *Cephalograptus*. Such a form is furnished by *C. n. sp.*, which is in some respects intermediate between *Petalograptus* and *Cephalograptus*. The extreme form is reached in *C. cometa*, in which the first hydrotheca of the second series is still later, the hydrothecæ are still longer than those of earlier forms and almost parallel to the long axis of the rhabdosoma. The other known forms of *Petalograptus* may have been derived from *P. palmatus*.

It seems exceedingly likely that the *Petalograpti* had a *Phyllograptus* as a remote ancestor, but the evidence for this is not yet complete, nor can the Author state whether *Cephalograptus* had a further stage in a form of *Dimorphograptus*.

MISCELLANEOUS.

What are the Names of the Crayfish and Lobster?

By R. I. Pocock.

THE hope of being able to supply an answer to the above question gives me the courage at this juncture to intervene in the discussion concerning *Astacus* and *Potamobius* started in the 'Annals' of last December by Prof. Bell; for, in spite of all that has been written on the subject, it may be doubted whether those who are not specially conversant with the questions of nomenclature that have been raised are any more enlightened as to the correct names of these now famous crustaceans than they were before the controversy began.

It seems to me, however, that the question may be set at rest by the application of a principle in nomenclature which is becoming widely accepted amongst systematic zoologists, and will doubtless be universally admitted when our views are a little more coherent and advanced than they are at the present time. It is one of the principles for selecting the type species of a genus when no type has been designated by its author, and may be stated as follows:—When the name of a genus is the same as that of one of its component species, that species is the type of the genus.

If this principle be applied to the case of the lobster and the crayfish, it will be found that the name *Astacus* must be attached to the latter, for in both the tenth and twelfth editions of the 'Systema' Linnæus called the Swedish crayfish *Cancer astacus*; and since *Astacus* was subsequently used by both Gronovius and Fabricius as a generic term for a group comprising amongst other species the *Cancer astacus* of Linnæus, the latter is *ipso facto* the type of the genus *Astacus*. Therefore the name of the Swedish crayfish is *Astacus astacus* (Linn.). With *Astacus* thus fixed definitely on to the crayfish, *Homarus* will, it seems, without let or hindrance, resume its place for the lobster, with the specific name *gammarus* which Linnæus assigned to it.

This appears to me to be a sensible and simple solution of this and other similar cases. In the present instance it does away with difficulties arising in connexion with the subsequent actions of Leach, White, Milne-Edwards, and others, and is independent of the selection of the tenth or twelfth edition of the 'Systema' as the starting-point in systematic zoology.

In conclusion, there is one little point about which it may perhaps be permitted to me to put Mr. Stebbing right. From some words that appear in his contribution to the present discussion it is to be inferred, though perhaps wrongly, that he considers a semi-official system of nomenclature to be in vogue at the Natural History

Museum, and agreement on this point to exist amongst the members of the staff. Happily nothing could be further from the truth. There may be some subjects about which unanimity could be found, but nomenclature is certainly not one of them.

The Lobster and the Crayfish: a Reply.

By the Rev. THOMAS R. R. STERBING, M.A., F.R.S., F.L.S.

Pallas, in his 'Spicilegia Zoologica,' fasc. ix. p. 81, speaks of a crayfish as *Astacus dauuricus*. Since this was in 1772, Dr. Arnold Ortmann, in a courteous letter, asks what bearing this may be thought to have on the claim of Fabricius in 1775 to rank as the first Linnean authority for *Astacus*. Dr. Ortmann indicates in advance his acceptance of the appropriate answer. Pallas is neither defining a genus nor even instituting a new species, for he speaks of *Astacus dauuricus* as a variety of the common crayfish, and proceeds to give a "Descriptio Cancrī dauurici," in which he says that "Forma atque proportione Astaco nostrati minori persimilis est." It is evident that he is using *Astacus* only as a customary designation for a subdivision of the still-maintained genus *Cancer*, and by his reference to a minor *Astacus* he implies a major species, which would have had preference as type if at that time any question had arisen as to the proper type species of *Astacus*. In his index *dauuricus* becomes *dauricus*, but under neither spelling can it become the type of a genus which by the very terms of the description possessed an earlier species.

From Pallas I must return to Professor Bell and endeavour to deal in orderly method with the six points of his crushing reply.

(i.) In regard to the date of *Nephrops*, he is surprised at my supposing that he referred to Leach's article "Crustaceology," instead of to Leach's paper in vol. xi. of the Linnean 'Transactions.' Yet what else could or can be supposed, since he himself gave the date 1814, which applies to the former and does not apply to the latter? To be sure the "Crustaceology" is unsigned, and an edition of it may have appeared in 1813, but, seeing that Leach claimed it as his own on the very first day of January, 1815, it is rather my turn to be surprised that Professor Bell should refer to it as "an anonymous article of uncertain date."

(ii.) That the genera of Gronovius "are as good as those of" Brisson may or may not be true, but that the particular genus *Astacus* was instituted by Gronovius, or was so defined or so used by Gronovius as to give him any title to be the authority for it, may be with confidence denied. Besides, the whole question turns on the choice of a type species, and the Gronovian species are admittedly out of court.

(iii.) That 1758 has long been held by many naturalists to be "the zoological *ab urbe condita* of binominal chronology" I was not unaware; but in 1890 the authorities of the British Museum had not yet endorsed that excellent opinion. To the question whether I know "that 1758 has been well called" by the terms of the above quotation, my answer would be in the negative, for, though the

sentiment is sound, it is not well but ill expressed. There was no need for a confusion of languages in the macaronic style, nor for comparing the definite and well-known year 1758 with the disputed and uncertain date of the foundation of Rome. But I fear that Professor Bell only asked the question mischievously, to lure me into "gibing," as he calls it, at some fearfully eminent person.

(iv., v.) It seems essential once more emphatically to explain that Desmarest never mentions *Potamobius* at all, though Professor Bell, misquoting himself as well as Desmarest, insists that he does. In his first paper the professor accurately cited Desmarest's suggestion that *Potamobia* of Leach might be the same as the river-crab *Thelphusa*. Now he persuades himself that Desmarest definitely said that "Leach's *Potamobius* was a river-crab." Leach, in 1818, applied a French name—*Potamobie*—to some genus of crustaceans, but without a single word of description; so that, had the name been valid in form, it would still have been absolutely without any scientific importance. In 1823 Desmarest Latinizes the name into *Potamobia*, and hazards a guess at the application intended. Meanwhile, in 1819, through Samouelle's 'Compendium,' and very obviously without the knowledge of Desmarest, Leach had assigned the crayfish to a properly constituted genus *Potamobius*. Now, lastly, in 1897 Professor Bell apparently wishes us to believe that *Potamobius* was somehow preoccupied in 1819, because Desmarest made a casual allusion to a wholly indefinite *Potamobia* in 1823!

(vi.) From the solemn severity of tone in his closing paragraph it seems as if Professor Bell imagined that his reputation as a naturalist was involved in this discussion. He should not harbour such a thought. The controversy has been, not about nature, but about names. From Leach's 'Malacostraca Podophthalmata Britannia,' as completed in recent times by Mr. G. B. Sowerby, it will be seen that I have been fighting on the side of a long line of authorities of the British Museum. Professor Bell, out of charity or out of friendship, should allow this to weigh in the balance against the sad offence—of which he hopes (perhaps against hope) that I have by this time repented,—the unwitting offence of gibing at men of renown, living and dead, infallible, authors of text-books.

Nocturnal protective Coloration in Mammals, Birds, Fishes, Insects, &c., as developed by Natural Selection *. By A. E. VERRILL.

Much has been written in respect to the imitative and protective colours of these groups, as seen by daylight, and the bearing of these facts on natural selection is well known. Very little attention has been paid to their colours, as seen by twilight, moonlight, and starlight. Yet it is evident that protection is more needed during the night than in the daytime by a very large number of species. This is the case with those that move about in search of their food at night, as is the habit of numerous forms of small mammals, such as rodents (rats, mice, arvicolæ, &c.), insectivores (moles, shrews, &c.), many herbivores, various marsupials, and members of other

* Abstract of a paper read before the Morphological Society, Dec. 30, 1896.

orders. Many carnivorous species, which seek their prey at night, will also find advantages in such protective colours, for thus they will more easily escape the notice of their prey. Hence many nocturnal carnivores are black or nearly so, as the mink, fishes, some bears, &c. The same principles will apply to birds, reptiles, fishes, and to insects, both in their larval and adult states, for many members of all these groups are very active at night and hide away in holes or beneath dense herbage by day. Moreover, large numbers of birds, fishes, and insects, that are active by day, rest in exposed situations at night, and are thus liable to be destroyed by nocturnal enemies. Most small birds roost in trees, bushes, or reeds, and therefore need protection while sleeping. Most small fishes, that are quiet at night, rest among sea-weeds, grasses, and stones, or else directly upon the bottom, exposed to the attacks of many nocturnal carnivorous species. The struggle for existence is severe among such species. It is to be expected, therefore, that instances of nocturnal protective coloration will become numerous when looked for. The chief object of the present paper is to call the attention of more observers to this subject.

In many cases the same colours are equally protective in daylight and at night. This is the case with the green colours, so often seen in the plumage of birds that live among foliage, and with the various shades of brown and grey,—common colours of birds, and mammals that live on the ground, among rocks or dead leaves, and of those that live on or among tree-trunks. The same applies to the white colours of mammals and birds in winter and in the arctic regions. But there are many colours that are not in the least protective by day, yet are eminently so by night. In general, the black and very dark colours, common in mammals, birds, and insects, are protective at night and not by day. One of the most obvious effects of moonlight is to give very strong or black shadows, in which black or dark animals become invisible, or nearly so. This invisibility is often increased by sharply contrasted stripes or patches of white or light yellow, which look like patches of moonlight falling across a dark shadow, and thus serve to break up the outlines of bird or beast that might otherwise be recognized. Transverse black or dark brown bands on fishes that rest among eel-grass or sea-weeds tend to render the outlines of the fish indistinct, because they look like the shadows and shaded surfaces of the weeds. Black fins and tails have a similar effect in concealing or destroying the outline of fishes. The striped colours of the tiger have the same effect when it lives among the stalks of reeds, etc., and are probably much more effective in twilight or moonlight than by day. The same is true of the spotted pattern of the leopard, panther, and jaguar.

A great number of small nocturnal mammals, belonging to diverse groups, have dark grey and greyish-brown colours (mouse-colours), which are highly protective at night, but are usually not at all so in the daytime, for such colours are conspicuous among the green herbage which they frequent and on which most of them feed. Moreover, nearly all such mammals hide away in holes in the day-

time. I have noticed that our common meadow-mouse (*Arvicola*), which is very dark grey, is scarcely to be seen even in a moonlight night in localities where it is very abundant among grass, and when large numbers are so near that the sound made by their teeth in feeding is very evident. Among insects there are multitudes of instances of colours that are evidently nocturnally protective and which can be explained only on the basis of natural selection, favouring the variations in colour that are in this way most useful. Such colours may or may not be more or less protective in the daytime. Frequently they appear to be just the opposite of protective in the daytime. Thus many butterflies have bright colours that are very conspicuous by daylight and which do not in any way match their customary surroundings. This applies to those species that are black or dark blue, striped or blotched with white, yellow, or orange, and to many species that are spotted or striped with red, orange, and black on the upper surface of the wings, and often also beneath, so that they are conspicuous whether flying or at rest. Their active habits and acute senses probably give them fair protection by day. At night, when resting with the wings folded, the colours of the underside of the wings usually blend very perfectly with those of the flowers on which they roost. Many of our species of *Argynnis* and allied genera are marked with red, orange, and brown, while there are bright silvery patches on the underside of the wings, which are exposed when at rest. I have observed that these butterflies become very inconspicuous in the moonlight, when sleeping on the goldenrod and other favourite flowers, and that their silvery spots imitate very closely the dew-drops that surround them.

Numerous nocturnal insects that live on the ground are black or dark brown, which are colours that are protective only at night. This is true of most ground-beetles, many crickets, cockroaches, ants, &c. Many of these insects hide away in the daytime, so that no protective colours are then needed. But many insects that are exposed both during the day and at night have acquired green or yellowish colours that are protective at all times, when living among foliage. Green grasshoppers, katydids, &c. are examples.

In general, patches, stripes, or spots of strongly contrasted dark and light colours are more likely to be of use by moonlight than by daylight, whether on birds or insects. Reptiles are to a large extent diurnal in their habits and many kinds hide in holes and crevices when at rest, so that our native species of this group appear to afford few good instances of evident nocturnal protective colours, though many may occur when the habits of tropical species become better known. Among nocturnal amphibians protective colours are common, and in many cases they appear to be exclusively for nocturnal protection. Our native nearly black species of salamanders (*Amblystoma punctatum* and *A. opacum*) have conspicuous spots or blotches of white or light yellow. It is evident that these colours have been acquired by natural selection in consequence of the nocturnal protection that they afford.—*Amer. Journ. Sci.*, February 1897, pp. 132-134.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SIXTH SERIES.]

No. 112. APRIL 1897.

XXXIII.—*Report upon the Scorpiones and Pedipalpi obtained on the Lower Amazons by Messrs. E. E. Austen and F. Pickard Cambridge during the trip of Mr. Siemens's Steamship 'Faraday.'* By R. I. Pocock.

THOUGH all the species of Pedipalpi brought back by Messrs. Austen and Cambridge prove referable to previously known species, they are nevertheless of considerable interest as desiderata to the collection of the British Museum and as serving to fill important gaps in our knowledge on points of geographical distribution, constancy of structural features, &c. Of the species of Scorpions, all but one—namely, *Brotheas Gervaisii*—appear to be undescribed. The discovery, however, even of this form is of value, since the species was established upon two specimens of which the locality was unknown. The other species are nearly allied to forms that occur in the north and north-western countries of South America (Guiana, Colombia, &c.); but it is interesting to note that no member of the family Bothriuridæ nor of the genera *Centrurus*, *Hadruroides*, *Caraboctonus*, *Chactas*, *Opisthacanthus*, *Diplocentrus*, &c., which occur in other parts of the continent, seem to be represented on the Lower Amazons.

Order PEDIPALPI.

Family Tarantulidæ.

Subfamily *Admetinæ*, nom. nov.(= *Tarantulinæ*, Simon; *Neophryninæ*, Kraepelin.)Genus *Admetus*, C. Koch.*Admetus*, C. Koch, Uebersicht des Arachnidensystem, 1850, p. 81;

Simon, Ann. Soc. Ent. Fr. 1892, p. 51.

Neophrynus, Kraepelin, Abh. Hamburg. Anst. xiii. pp. 21 & 23 (1895).

The genus *Admetus* was established by C. Koch for the following species of *Phrynus*:—*pumilio*, Perty, *fuscimanus*, C. K., *marginemaculatus*, C. K., and *palmatus*, Herbst; and since none of these species have any other generic name older than *Admetus* by which the group could be designated in accordance with accepted rules of nomenclature, *Admetus*, being unpreoccupied, must be reserved for one of the species mentioned; and since Simon, in 1895, distinctly selected *palmatus*, Herbst, as its type, and correctly diagnosed the genus, it is not easy to see Kraepelin's reasons for proposing the new name *Neophrynus* for the same section upon discovering that the names *Tarantula* and *Phrynus*, by which it had been previously (though erroneously) known by Karsch, Thorell, and myself, had to be used in a totally different sense. The fact that *pumilio*, one of the species referred by Koch to *Admetus*, is not congeneric with the others, does not interfere with Simon's right to apply *Admetus* to one of the latter, nor confer upon Kraepelin the power of disregarding the name as unusable.

Thus compelled to adopt *Admetus*, I venture to propose the new name *Admetinæ* for the subfamily embracing the three genera, *Admetus*, Koch, *Heterophrynus*, Poc., and *Phrynopsis*, Poc.

Admetus santarensis (Poc.).

Tarantula santarensis, Pocock, Ann. & Mag. Nat. Hist. (6) xiv. p. 284 (1894).

Many specimens were taken at Santarem, one in a house, a few in the forest, and many from a termite's nest upon the campos. The species was based upon a single female example brought from Santarem by Mr. Wickham.

This species differs from the forms that I have named *barbadensis*, *pulchripes*, and *Gervaisii* in possessing six long spines upon the trochanter of the chela instead of five.

The young are much more variegated in colour than the adults, the terga of the abdomen being ornamented with a pair of pale spots, which converge and become united upon the seventh segment.

Genus *HETEROPHRYNUS*, Poc.

Heterophrynus longicornis (Butler).

Phrynus longicornis, Butler, Ann. & Mag. Nat. Hist. (4) xii. p. 128 (1873).

Heterophrynus longicornis, Pocock, Ann. & Mag. Nat. Hist. (6) xiv. p. 267 (1894).

Several specimens of this species were obtained under tiles and bricks at Pará, others in termites' nests in the forest at Santarem, and one at Monte Alegre. It has been previously recorded from the two first-mentioned localities.

The only comment that it seems necessary to make in connexion with these specimens is that the shortness of the chela or palp in the male, which I pointed out as distinctive of this form as compared with *chiracanthus* and *Batesii*, though regarded as of no importance by Dr. Kraepelin, seems to be a perfectly constant, and therefore important, character. In *Batesii* and *chiracanthus* the femur of the chela is about twice the width of the carapace in length, whereas in *longicornis* the length of the chela only just exceeds the width of the carapace in the adult and is much less than the length of the femur of the second leg, instead of being approximately equal to it or greater than it, as in *chiracanthus* or *Batesii*. It is true that the chelæ are much shorter in the young than in the adult, but that the shortness of the organ in *longicornis* is not attributable to youth seems proved by the circumstance that it obtains in the largest specimens examined—specimens with the carapace attaining a width of 16–18 millim., the femur of the palp being but 19–20 millim., whereas in examples of *Batesii* with the carapace 12·5 millim. in width the femur of the appendage in question measures 25 millim. In an ovigerous female of *longicornis* from Pará, with the carapace 15 millim. wide, the femur of the chela measures 14·5 millim.

Family *Thelyphonidae*.

Genus *THELYPHONELLUS*, Poc.

Thelyphonellus amazonicus (Butler).

Thelyphonus amazonicus, Butler, Ann. & Mag. Nat. Hist. (4) x. p. 201, pl. xiii. fig. 2 (1872).

Thelyphonellus amazonicus, Pocock, Ann. & Mag. Nat. Hist. (6) xiv. p. 133 (1894).

Specimens obtained in the forest at Santarem and at Parintins under leaves and rotten wood.

The type of this species was obtained by H. W. Bates at Altar do Chão, Santarem.

Order SCORPIONES.

Family Buthidæ.

Genus ISOMETRUS, Hempr. & Ehrenb.

Isometrus maculatus (De Geer).

A specimen of this ubiquitous species was taken on the vessel at Pará.

Genus TITYUS, C. Koch.

Tityus Cambridgei, sp. n. (Figs. 1, 1 a, p. 362.)

♀.—*Colour* of upperside a uniform black or reddish black throughout, paler below; pectines testaceous; a triangular smooth testaceous area on the middle of the hinder border of the third sternite.

Sculpturing, granulation, &c. as in the Bogotá form *forcipula*, Gervais (= *americanus*, Thorell, Kraepelin, &c.), but not so coarse.

Tail parallel-sided, segments 2 and 4 of equal width, the fourth twice as long as wide; the inferior crests on segments 2-4 not confluent, the median lateral crest of the second only visible on the posterior fourth of the segment, or, at most, represented in front by minute granules; tail about $5\frac{1}{2}$ times the length of the carapace; the hand and digit a little less in length than the first two segments and half the third, and twice the length of the carapace; width of the fourth segment equal to half its length, width of the fifth a little less than half its length.

Hand as wide as the brachium, the latter only a little longer than the carapace and less than three times as long as broad; hand-back two thirds the length of the carapace and half the length of the movable digit, which has 15 rows of teeth.

Pectinal teeth 22; base of shaft lobate.

♂.—Tail feebly incrassate posteriorly as in the female, about $6\frac{1}{2}$ times the length of the carapace; the finger and hand as long as its first two segments and half the third, and $2\frac{1}{2}$ times the length of the carapace; fifth caudal segment nearly three times as long as wide.

Chela long and slender. Carapace about $\frac{1}{2}$ the length of

the brachium, which is at least four times as long as broad; hand long and slender, externally concave, its width equal to that of the brachium and about one third the length of the hand-back, which is a little less than the length of the carapace and more than half the length of the movable digit; digits in contact only feebly lobate basally.

Pectinal teeth 21-22.

Measurements in millimetres.—♀. Total length 72; length of carapace 7·8, of tail 43, length of its fourth segment 7·5, width 3·8; width of vesicle 2·8, of brachium and hand 2·8; length of brachium 8·5, of hand-back 5, of movable digit 10·2.

♂. Total length 80; length of carapace 7·6, of tail 52, length of fourth segment 9·5, width 3·5; width of vesicle 3, of brachium and hand 2·5; length of brachium 11, of hand-back 7, of movable digit 12.

Loc. Pará (type, two males and a female).

Apart from finer granulation &c., this species may be distinguished from *T. forcipula*, Gervais, by the following features:—

In the female of *forcipula* (co-typical example) the tail is very distinctly incrassate, the fourth and fifth segments being distinctly wider than the first, and their width about $\frac{3}{4}$ their length; the crests are much stronger and the median lateral on the second is complete, though weaker forwards. Still more striking are the differential characters of the male: as I have already pointed out (*Ann. & Mag. Nat. Hist.*, June 1889, pp. 54-56), the male of *forcipula* has the tail of normal length, but enormously thickened posteriorly, the width of the fourth segment being almost equal to its length; again, the chelæ are not elongate, but the hand is enormously thickened, nearly twice the width of the brachium, the digits being widely separated, sinuate and lobate.

In its sexual features *Cambridgei* resembles *androcottoides* of Karsch, but, apart from the differential feature presented by the distinctness of the inferior caudal keels, the hand of the male has a different form, as also has the vesicle of the tail.

Tityus metuendus, sp. n. (Figs. 2, 2 a, p. 362.)

♀.—Very like that of *T. Cambridgei*, but the tail thicker, the width of the fourth segment considerably more than half its length; the granulations of the tail also much less distinct.

Hand distinctly wider than the brachium and much less strongly crested than in *Cambridgei*.

Pectinal teeth 19.

♂.—Strikingly different from male of *Cambridgei* and approaching that of *forcipula* in the nature of its sexual characters. Tail incrassate to the middle of the fifth segment; width of the fourth and fifth considerably more than half their length, the whole tail about $6\frac{1}{2}$ times the length of the carapace; the finger and hand as long as the first two segments and one third of the third, and only a little more than twice the length of the carapace; vesicle granular below and about equal to the brachium in width.

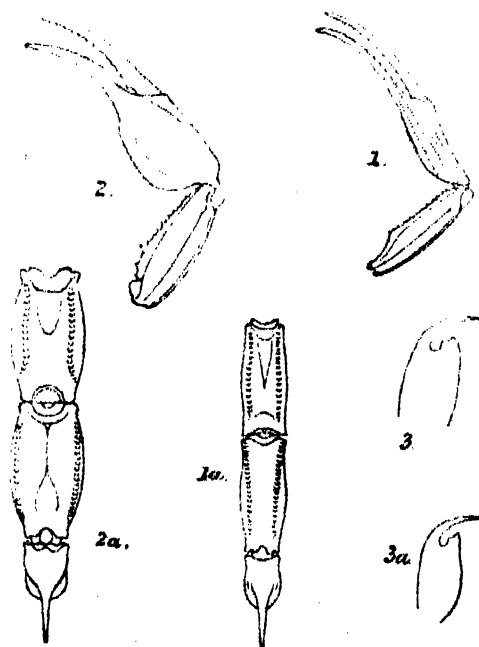


Fig. 1.—Hand and forearm of *Tityus Cambridgei* ♂.

Fig. 1 a.—Posterior end of tail of ditto.

Fig. 2.—Hand and forearm of *T. metuendus* ♂.

Fig. 2 a.—Posterior end of tail of ditto.

Fig. 3.—Vesicle of *T. silvestris*.

Fig. 3 a.—Ditto of *T. paraguayensis*, Kraep.

Chela moderately elongate; brachium not four times as long as wide; hand much expanded, much wider than brachium, its width about two thirds the length of the hand-back; the movable digit strongly lobate at the base, the immovable sinuate, leaving a narrow space between them when closed.

Pectinal teeth 20–21.

Measurements in millimetres.—♀. Total length 77; length of carapace 8, of tail 46, width of its first and fourth segments 5, length of fourth 8; width of vesicle 3, of brachium 3.3, of hand 4; length of brachium 9, of hand-back 5.1, of movable digit 10.8.

♂. Total length 97; length of carapace 9.5, of tail 61, width of first segment 5, length 7.7, width of fourth 6.3, length 11; width of vesicle 3.8, of brachium 3.6, of hand 5.8; length of brachium 11.5, of hand-back 8, of movable digit 13.

Loc. of type (♂). Above Iquitos, on the Marañon or Amazons.

The Museum has two males and three females of this form from the above locality, and Mr. Cambridge procured one male specimen at Parintins, up the river above Santarem. This example has the chelæ rather more slender than in the two males from Iquitos; but since these two are not quite alike in the structure of the appendage, it would be incautious to attach a new name to the Parintins specimen without further material wherewith to test the constancy of the differences. The distinctions between this form and *forcipula* will be further discussed in a future paper.

Tityus silvestris, sp. n. (Fig. 3, p. 362.)

Belonging to the *columbianus* group of species and approaching most closely to the Demerara form *T. Quelchii*, Poc. (Ann. & Mag. Nat. Hist. (6) xii. p. 314, pl. xiv. fig. 1, 1891), and to the Paraguayan form *T. paraguayensis*, Kraepelin (Jahrb. Hamburg. Anstalten, xii. p. 19, 1895), of which the British Museum has examples collected at Assuncion by Dr. Bohls.

The dorsal and sternal surfaces of the trunk densely spotted black and yellow; there is, however, a conspicuous bright yellow T-shaped mark on the fore part of the carapace, a similar mark being much less conspicuous in *paraguayensis* and not noticeable in *Quelchii*, which is of a much more uniform tint and less distinctly mottled.

In *silvestris*, moreover, not only are the maxillary lobes infuscate throughout their length, but the dark pigment, in addition, spreads on to the coxæ of the second, third, and sometimes also of the fourth leg, whereas in the specimens of the other two species that I have seen the maxillary lobes are infuscate only at the tip, there being, however, in *paraguayensis* also a single spot upon the coxæ of the second leg.

In structural features *Quelchii* has better developed granulation and stronger keels, the sculpturing of *paraguayensis*

being finer than in *silvestris*, as is particularly noticeable on the superior caudal crests. And, lastly, in *silvestris* the vesicle is higher than in the other species, the tooth beneath the aculeus being very high, with a blunt and obliquely truncate apex.

Pectinal teeth 14-16 (in a young specimen 12-13). The single male example has 15. Rows of teeth on digit 14 (not including small apical rows); 15-16 along the outer row. (In *Quelchii* there are 13-14 rows of teeth, and not 11-12 as erroneously stated in the original diagnosis.)

The sexual characters are the same as in *paraguayensis*, but the fourth and fifth segments are much less strongly elevated.

♀. Total length of body and tail 34 millim., of tail 19.5; width of first segment 2, of fifth 1.5; width of brachium and hand 1.8.

♂. Total length 30.5, of tail 19, width of its first and fifth segments 2; width of brachium 1.5, of hand 2.

Loc. Santarem. Several specimens collected in the forest by Mr. F. O. P. Cambridge.

Note.—In addition to the specimens of *Tityus* here recorded, other examples belonging to the *americanus* type were collected at Paraná Buyassu and in the forest at Santarem; but since only females were obtained, I have refrained from definitely attaching names to them, seeing that they are not structurally identical with the females either of *Cambridgei* or of *metuendus*.

Family Iuridae.

Subfamily CHACTINI.

Genus BROTEOCHACTAS, Poc.

Broteochactas parvulus, sp. n.

♀.—*Colour* a tolerably uniform blackish-brown, redder on chela and vesicle; legs fulvous, with femur and patella externally infusate; lower surface fulvo-fuscous; pectines testaceous.

Carapace with its anterior border very slightly emarginate; the interocular area and the dorsal portion of the area behind the median eyes smooth; lateral portions closely and finely granular, with a few larger granules intermixed.

Terga shining, nearly smooth, finely granular laterally and mesially, with a few larger granules intermixed, the last more coarsely granular, but without distinct crests.

Sterna entirely smooth and polished; a few large punctures here and there.

Tail a little more than three times as long as carapace, posteriorly narrowed; lower surfaces of segments 1-3 smooth, polished, keelless, but furnished with long bristles; the superior and superior lateral keel distinct and weakly granular, terminating on the second segment in an angular tooth; fourth segment like the third, but sparsely granular below, upperside of these segments sparsely granular; upperside of fifth without granules except on the side margins; the sides granular, the lower surface coarsely but not closely granular, lateral keels granular; vesicle coarsely granular below, hairy, smooth at base of aculeus.

Chela with humerus granular above on its anterior and posterior keel; brachium smooth, not keeled, hairy; hand smooth, polished and punctured above except towards the inner edge and the base of the immovable digit, where there is coarse granulation, the inner edge with a distinct basal tooth; hand-back and lower surface quite smooth, immovable digit stout, punctured, rugose.

Legs smooth except for the femora of third and fourth, which are finely granular externally.

Pectinal teeth 6-7.

♂.—Like the female, but with the carapace, terga, the sides of the caudal segment, including also the lower surface of the third and fourth, and the lateral portions of the sterna finely shagreened with granules.

Pectines larger, 8-9 teeth, in which the sensory area extends up to the base; upper surface of hand not so smooth as in the female, but only very finely shagreened externally.

Measurements in millimetres.—♀. Total length 27; length of carapace 3.5, of tail 13, width of its first segment 2.

♂. Total length 24; length of carapace 3.5, of tail 13.8.

Loc. Santarem. Several specimens taken in the forest beneath rotten wood by Mr. Cambridge.

The three known species of this genus may be recognized by the following table:—

Female.

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <p>a. Carapace and terga and external surfaces of femora of legs smooth, without granules; hand and brachium also almost entirely smooth, as well as the sides of the fifth caudal segment.</p> | <p><i>Gollmeri</i> (Karsch)
(= <i>nitidus</i>, Poc.). (Venezuela and Trinidad.)</p> |
| <p>b. Carapace, external surface of femora of third and fourth legs, sides of fifth caudal segment,</p> | |

and at least the inner portion of the upper surface of the hand distinctly granular.

- a¹. Upper and outer surfaces of brachium and hand covered with a reticulated pattern of granules; lower surface of hand and crest of hand-back also granular: length of adult about 50 millim. *delicatus* (Karsch). (Guiana.)
- b¹. Brachium, lower surface of hand and keel of hand, and area of hand adjacent to it smooth: adult less than 30 millim. *parvulus*, sp. n. (Santarem.)

Male.

- a. Carapace and terga more closely and coarsely granular; sterna distinctly granular at the sides, the anterior ones more so than the posterior; lower surface of hand and upper surface externally smooth *parvulus*, sp. n.
- b. Carapace and terga less closely granular; sterna almost entirely smooth; hand distinctly granular above and below.
- a¹. External portion of upper surface of hand and crest of hand-back only very finely granular: less than 40 millim. *Gollmeri* (Karsch).
- b¹. External portion of upper surface of hand and keel of hand-back coarsely granular: over 40 millim. in length *delicatus*, Karsch.

Genus BROTHEAS, C. Koch.

Brotheus Gervaisii, Poc.

Brotheus Gervaisii, Poc. Ann. & Mag. Nat. Hist. (6) xii. p. 78 (1898).

A single female specimen obtained at Gurupa.

This example differs from the type in certain characters, which, in the absence of more material, can hardly be regarded as of specific importance. For example, the intercarinal spaces of the tail are a little less granular and the carapace and terga a little more so than in the typical female of *Gervaisii*, Poc. Again, the vesicle is very much narrower than the fifth caudal segment, whereas in *Gervaisii* it is nearly as wide. These are characters, however, which appear to be subject to variation with age, for small examples of *Herbstii* taken in Demerara by Mr. W. L. Sclater are far more granular than adults captured by the same collector in the same locality, and they have the vesicle noticeably narrower. Consequently the distinctive features of this Gurupa specimen may be provisionally attributed to immaturity. The discovery of the specimen is, however, of great interest, inasmuch as no locality was previously known for the species.

In connexion with Prof. Kraepelin's latest utterances upon the subject of the genus *Brotheas*, the following observations may be made (see JB. Hamburg. Anst. xi. no. 1, p. 173, 1894) :—

In the first place, this author reserves the name *maurus*, Herbst, for the type of the genus, on the grounds that the species identified as *Scorpio maurus* by Herbst is generically distinct from the *Scorpio maurus* of Linné. He therefore admits in his system both *Heterometrus maurus* (Linn.) (= the true *Scorpio maurus*, Linn.) and *Brotheas maurus* (Herbst) (= *Scorpio maurus*, Linn., Herbst). This, however, is not the practice that is usually followed in such matters. Nor has Kraepelin himself applied this principle of nomenclature in analogous cases: if he had done so, consistency would have compelled him to adopt such names as *Parabuthus australis* (Herbst), *Androctonus australis* (Linn.), *Centruroides australis* (De Geer); or, again, *Tarantula reniformis* (Linn.), *Neophrynus reniformis* (Fabr.), and *Heterophrynus reniformis* (Pallas).

In the second place, if *maurus* be retained as the specific name of the type species of *Brotheas*, De Geer, and not Herbst, should be cited as its author, the former in 1778 being the first to start the error, which was subsequently handed on by Herbst and C. Koch. This, however, is a matter of but little importance, seeing that the name *maurus* cannot be retained for the species. For this I adopt the name *Herbstii*, proposed by Thorell (Ann. & Mag. Nat. Hist. (6) xvii. p. 14, 1876). It is to be observed, however, that Thorell primarily gave the name *Herbstii* to the species wrongly identified as *maurus* by De Geer and later writers, without regard to the possibility of more than one species being involved. But the type of *Brotheas*, C. Koch, must presumably be the species upon which C. Koch establishes the genus. Therefore it seems that it is to this species that the name *Herbstii* must be affixed. The fact that the species came from Cayenne renders it probable that my identification of certain specimens from Demerara in the British Museum as *Herbstii* is correct, and at the same time throws doubt upon the identity of Simon's *Herbstii* from La Plata (see Ann. Soc. Ent. Fr. 1877, p. 241). Finally, it may be added that the description of Simon's species *paraensis* (Ann. Soc. Ent. Fr. 1880, p. 381) does not apply to the females of the Demerara specimens mentioned above, so that if the latter are correctly named, as I venture to think probable, it is impossible to follow Kraepelin in regarding *paraensis* as a synonym of *Herbstii*.

The females of the two species known to me in nature may be recognized as follows:—

- a. Lower surface of first caudal segment coarsely granular, its median keels granular *Herbatii*, Thor. (Guiana.)
- b. Lower surface of first caudal segment smooth, punctured, without granules, its keels obsolete..... *Gervaisii*, Poc. (Amazona.)

B. paraensis, Sim., from Pará, based probably upon a female, differs from the above in having the carapace entirely devoid of granules; while *B. granulatus*, on the contrary, from Cayenne, the type of which is doubtless a male, is not from the description distinguishable from the males identified as *Herbatii* in the Museum collection.

XXXIV.—*New Species of Hymenoptera from Central America.* By P. CAMERON, F.E.S.

[Concluded from p. 276.]

Fam. Sphegidae.

PODIUM.

Podium crassipes, sp. n.

Nigrum; alis fuliginosis. ♂.
Long. 40 millim.

Hab. Mexico, Omealca, near Orizaba (*M. Trujillo*).

Antennæ reaching to the scutellum, bare, pruinose. Head below the ocelli with widely separated punctures; the front thickly covered with long black hair; the vertex glabrous; a narrow thin furrow leading to the ocelli, uniting to a short, shallow, narrow transverse one behind them; there is a narrow longitudinal keel above the ocelli. The antennæ are inserted immediately over the clypeus, which at the apex projects, is roundly concave, and is roundly and rather deeply incised, and bears a few shallow punctures. The eyes reach to the base of the mandibles and converge slightly above. The prothorax is elongate, being nearly as long as the mesonotum; the anterior is separated from the longer posterior portion by a deep transverse furrow, its centre being raised behind; the anterior region is punctured and bears long black hairs, the punctureless part of the posterior portion

being almost glabrous. The anterior part of the mesonotum is covered with long black hairs and with distinctly separated punctures, the sides, too, towards the apex being longitudinally depressed. The median segment is as long as the pro- and mesothorax united; above, it is thickly covered with long black hair, closely transversely striated, a broad and deep depression down its centre, and there is another broad depression at its sides at the base and a narrower one in the middle at the sides. The pleuræ are covered with long black hairs. The propleuræ have a broad deep oblique depression in the centre, behind which they are rather strongly punctured, in front of it with only a few punctures. The mesopleuræ bear distinctly separated punctures, except on the sides of the oblique depression in the centre, above which they are obscurely longitudinally striated. The metapleuræ are impunctate. The mesosternum is covered with long black hairs and with distinctly separated punctures; there is a deep longitudinal channel down its centre, at the end of which it becomes depressed, rising again towards the mesocoxæ, the space between being hollowed and at the sides longitudinally crenulated, the part between the coxæ being slightly punctured at the sides and broadly furrowed down the centre, the sides of the furrow towards the apex having a few longitudinal keels. The petiole is longer than the hind coxæ and the second abdominal segment; the other abdominal segments shining, glabrous, the second segment depressed at the base in the centre. The third to the sixth ventral segments are alutaceous. Wings deep dark violaceous, the nervures black; the first recurrent nervure is received at half the distance from the base that the second is from the apex. The legs are almost glabrous; the tarsi spinose; the hind tibiæ spinose on the inner side, and with six irregular somewhat oval depressions on the outer side. The hind trochanters are twice the length of the coxæ. The hinder femora are broadly dilated towards the apex; the apex on the outer side is somewhat hollowed and depressed above, the top of the depression being distinctly margined, the middle above at the apex having five stout curved keels, in front of which are a few narrower oblique keels; beneath near the apex the centre is raised and the sides in the middle at the apex project into two stout teeth, between which the tibiæ fit when bent downwards.

P. crassipes may be known from the other species of *Podium* described by me by the longer bipartite prothorax, the longer hind trochanters, and the longer clavate hinder femora. The hind claws have two teeth at the base. The hind tarsi are twice the length of the tibiæ.

SPHEX, Fabr.

Sphex (Priononyx) laerma, sp. n.

Long. 28 millim.

Hab. Mexico, Rio Papagaio in Guerrero, 1200 feet (H. H. Smith).

Agrees in coloration with *S. Thomæ*, Fabr., except that the wings are deep dark violaceous; differing otherwise in being much longer, in the thorax wanting the thick pale pubescence, and in the scutellum being broadly furrowed down the middle.

Eyes parallel. The hinder ocelli separated from each other by about the same distance they are from the eyes. Cheeks and clypeus covered with silvery pubescence; the vertex sparsely clothed with moderately long black hair, below the antennæ with longer black hair. Apex of the clypeus transverse and with a small indentation in the centre; the sides broadly rounded. Behind the ocelli is a shallow curved furrow, behind which at the sides is a small roundish depression; there is a shallow longitudinal furrow between the ocelli and at the sides of the hinder pair, the front one being surrounded by a furrow. The scape of the antennæ is sparsely covered with long black hair; the flagellum pruinose. The pronotum is depressed near the base, the depression being shining and impunctate; the apex is finely transversely shagreened and slightly longitudinally depressed in the middle; the pleuræ alutaceous, except a shining spot on the lower part at the apex; the base longitudinally striated; at the apex is a curved narrow fringe of pale golden pubescence. Mesonotum opaque, covered with short pale hair; closely longitudinally striated, furrowed down the middle, the furrow at the base wide. Scutellum wide, raised, the middle depressed broadly; shagreened, the sides shining, impunctate. Median segment alutaceous, covered closely with pale soft hair; closely transversely striolated, the apex before the depression broadly furrowed. The mesopleuræ closely and rather strongly, the metapleuræ obliquely, striated. The petiole is black and is as long as the hinder coxæ, covered with long pale soft hair. The rest of the abdomen is shining rufous; a black triangular mark on the second segment, the narrowed part at its base; the third segment is broadly black at the base. Wings uniformly dark violaceous; the first and second transverse cubital nervures oblique, both bullated at the lower part, the third curved and much narrowed towards the second at the top, the space between them there

being about the same as that bounded by the first recurrent and first transverse cubital nervures. The fore femora have a line of coarse deep punctures on the lower side; the tibiæ and tarsi are strongly spinose; the hind claws bear four stout blunt teeth, closely pressed together.

This species approaches the North-American *Sphex bifoveatus*, Taschenberg, but, *inter alia*, is readily separated by the dark violaceous wings, Taschenberg's insect having them "subhyalinis."

Fam. **Bembicidæ.**

BEMBIDULA, Burm.

Bembidula affinis, sp. n.

Long. fere 11 millim. ♀.

Hab. Mexico, Dos Arroyos in Guerrero (*H. H. Smith*).

Allied to *B. capnoptera*, Handl., but smaller, the markings of a paler yellow, and the labrum entirely black.

Antennæ black, the scape yellow beneath; covered with a pale down, which is thicker towards the apex of the flagellum; the clypeus is yellow, except round the apex; the inner orbits yellow to a little above the middle of the eyes, the outer orbits more narrowly lined with yellow, except at the top and apex. The labrum, front, and vertex rather thickly covered with silvery-white hair. Thorax thickly covered with short silvery pubescence, which becomes golden in hue towards the base of the mesonotum; two short marks at the base of the mesonotum, a broad line from near the base of the tegulæ to the base of the scutellum, two broad marks at the side of the scutellum, but not reaching its apex, the postscutellum, an interrupted line (broad at the apex) along the side of the median segment, a line on the mesopleuræ under the tegulæ, and the apex of the median segment at the sides, broadly, lemon-yellow. The mesopleuræ are obscurely punctured, thickly covered with white hair; the metapleuræ more shining and deeply excavated. The abdominal segments are broadly banded with lemon-yellow at the apex, the bands being distinctly interrupted in the middle; the apical segment above with some large distinctly separated punctures; beneath bluntly keeled down the middle. Legs: the coxæ, trochanters, and femora to near the apex black, for the rest yellow, except the tarsi, which have a rufous tinge, especially towards the apex, the base being clear yellow. The wings have a faint fulvous tinge.

Fam. Pompilidæ.

PSEUDAGENIA, Kohl.

Pseudagenia tarsalis, sp. n.

Nigra, tarsi rufi; alis lacteis, fusco-bifasciatis. ♀.
Long. fere 12 millim.

Hab. Guatemala, Purula in Vera Paz (*Champion*).

Antennæ stout, pruinose; the third and fourth joints for the greater part rufous. Head covered with a fulvous microscopic pile; the eyes almost parallel, only very slightly converging above; the hinder ocelli separated from the eyes by about the same distance they are from each other; the tips of the mandibles piceous. Thorax densely pruinose, silvery, inclining to golden on the mesonotum. The apex of the median segment irregularly transversely striolated. The apex of the mesopleuræ crenulated, and there is an indistinct oblique furrow across its middle. Abdomen shining, pruinose. The first cloud in the fore wings extends equally across the transverse basal nervure, the second and wider cloud extending from the first cubital to the third transverse cubital nervure; the first and second transverse cubital nervures are oblique, straight, the third roundly curved in the middle and narrowed towards the second at the top; the first recurrent nervure is oblique and received shortly before the middle of the cellule, the second curved and recurved distinctly in front of the middle of the cellule.

Agrees closely with *P. Championi*, Cam., from Panama; but the wings at the apex are not fulvous, the basal cloud is much wider, the third cubital cellule is hardly narrowed at the top (while it is very much narrowed in *P. Championi*), and the tarsi are rufous.

SALIUS, Fabr.

Salius incomptus, sp. n.

Niger, longe nigro-hirtus; medio antennarum late rufis; tarsis posticis late flavis; alis flavis, fusco-bifasciatis. ♂.
Long. 9 millim.

Hab. Mexico, Omilteme in Guerrero, 8000 feet (*H. H. Smith*).

Antennæ somewhat shorter than the body; the basal three and the apical four joints black, the others orange-yellow; the scape covered with longish black hair, the flagellum with a microscopic down. Head densely covered with long thick

black hair; the inner orbits above the antennæ and the entire face below them yellow; the apex of the clypeus waved, the centre dilated; the mandibles and palpi entirely black. Thorax densely covered with long black hair. The median segment gradually rounded and obscurely transversely striated; at the base in the centre is a short, wide, deep longitudinal furrow united to a longer narrower transverse one. The propleuræ are slightly hollowed; immediately over the coxæ is a sharp, distinct, oblique keel, which towards the middle of the coxæ bends more obliquely downwards, and from this bend a narrow curved keel runs up towards the tegulæ, but not reaching them. At the base of the metapleuræ shortly below the middle is a moderately large fovea. Abdomen as long as the head and thorax united, densely covered with black hairs, especially towards the apex. Legs long, sparsely haired; the front knees and tibiæ and the hinder tarsi, except the apical joint, orange-yellow. The first cloud in the wings extends from the base of the first recurrent to shortly beyond the second recurrent nervure; the apical cloud commences at the end of the radial nervure; the nervures are orange, except in the clouded parts; the second cubital cellule at the top and bottom is a little shorter than the third; the recurrent nervures are both received shortly before the middle of the cellule. The hind wings are clouded at the apex.

Allied to *S. omiltemius*.

Salix imitatrix, sp. n.

Niger, basi antennarum pedibusque anterioribus rufis; alis hyalinis, fusco-bifasciatis. ♀.

Long. 9 millim.

Hab. Mexico, Cuernavaca in Morelos (*H. H. Smith*).

Almost identical in coloration with *Pseudagenia isthmica*, Cam., from Chiriqui. Antennæ covered with a microscopic down; the basal three joints rufous. The head from a little above the antennæ covered with a pale golden pile; the mandibles pale at the base, piceous before the teeth, which are black; a shallow furrow leads down from near the ocelli; the hinder ocelli are separated from each other by a slightly greater distance than they are from the eyes, which converge a little at the top. Thorax covered with a pale golden down; the collar white on either side above. Abdomen pruinose, the apex densely covered with rather long pale yellowish hairs. The four front femora have the basal half black and the apical half reddish; the fore tibiæ, the two basal joints of the fore tarsi, the middle tibiæ broadly at the base, and the

two basal joints of the middle tarsi, rufous; the front calcaria rufous, the four hinder calcaria black. The first cloud in the fore wings is at the transverse basal nervure; the second cloud is enclosed by the first and third transverse cubital nervures; the second and third cubital cellules at the top are as wide as the space bounded by the recurrent and the transverse cubital nervures.

In my arrangement of the species in the 'Biologia Centrali-Americana,' Hymen. ii. p. 182, *S. imitatrix* should follow *S. nivalis*, Cam.

POMPILUS, Fabr.

Pompilus cerea, sp. n.

Niger, abdomine albosex-maculato; alis fumatis, albo-trifasciatis. ♀. Long. 18 millim.

Hab. Panama (*Boucard*).

Antennæ short, stout, covered with greyish pubescence. Head elongate in front, covered with a golden pubescence and with longish black hair; the eyes sinuate at the top, only very slightly converging at the bottom. Pronotum more than twice the length of the head, densely covered with long black hair. The mesonotum covered with long black hair, its base and the scutellum with pale golden pubescence; the apex of the scutellum with a distinct bordering keel, behind which it is covered with dense silvery pubescence at the sides, the central part being raised. The median segment velvety; the centre indistinctly keeled; the apex oblique, its sides and apex bearing velvety pubescence. The pleuræ are covered with a silvery pile. The legs covered with a black pile; the four hinder calcaria white. Abdomen a little, but distinctly, longer than the head and thorax united; the apex of the first and second segments incised in the middle; the white marks on the second to the fourth segments become successively smaller, and there is a large oval white mark on the top of the apical segment; the ventral segments are pruinose, the apical ones sparsely covered with long black hair. The wings are short, not reaching to the apex of the fifth abdominal segment. They are dark fuscous; there is an elongate white cloud under the costa, shortly in front of the transverse basal nervure, a broad band going completely across in front of and enclosing the lower part of the first transverse cubital nervure, and the extreme apex is also hyaline, but not so white as the other two clouds; both the transverse cubital nervures are curved and approach each other at the top; the first recurrent

nervure is received at a slightly greater distance from the base than the second is from the apex of the cellule.

A very distinct species. It belongs to my first section of the genus, near *P. impudicus*, Cam.

Pompilus rinconensis, sp. n.

Long. 18 millim. ♀.

Hab. Rincon in Guerrero (*H. H. Smith*).

Agrees closely with *P. impudicus*, Cam., from Panama, but it is much larger; the pile on the thorax is not orange, the head only hairy at the top, and the hinder ocelli are separated by a greater distance from the eyes.

Black: the prothorax, the base of the mesonotum, and the third and fourth abdominal segments covered densely with orange pubescence; the top and sides of the median segment, the sides and apex of the basal abdominal, and the first to the fourth ventral segments, the sternum, and the legs, densely covered with a greyish pruinose pubescence. The wings smoky, with a cloud before the transverse basal nervure, one in front of it, and the apex milky hyaline.

Antennæ short, black; the apex of the scape, the second joint, and the base of the third rufous; the flagellum covered with a microscopic down. Head shining, impunctate; the vertex behind the ocelli densely covered with golden pubescence; the hinder ocelli separated by a much greater distance from the eyes than they are from each other. The black central part of the thorax has a slight violaceous tinge. The sternum, the sides of the pleuræ above it, and the metapleuræ densely covered with a greyish pile. The apex of the median segment black, slightly excavated, the sides with some stout transverse striations. The first and third transverse cubital nervures are roundly curved, the second straight and hardly oblique; the first recurrent nervure is received in the apical third, the second almost in the centre of the cellule.

A second specimen, from Iguala in Guerrero (*Höge*), no doubt belongs to the same species; it has the pile on the thorax and head deep orange, this being also the case with that on the fourth and fifth abdominal segments, the sides of the pleuræ entirely covered with a grey pubescence, and, apparently, the abdomen is a little longer compared to the length of the thorax; it is also smaller.

Pompilus idris, sp. n.

Long. 8 millim. ♀.

Hab. Mexico, Atoyac in Vera Cruz (*H. H. Smith*).

Black ; two large marks on the side of the second abdominal segment and the fourth and fifth entirely dull orange-yellow ; the wings smoky, the base, apex, and a cloud behind the stigma whitish hyaline.

Antennæ short, thick, covered with an obscure microscopic pile, the base and apex of the scape piceous beneath. The apical half of the mandibles piceous. Above the antennæ the head is densely covered with golden pubescence, barer in the middle, but this may be owing to it having been rubbed off. The eyes curved, slightly converging towards the bottom. The hinder ocelli are separated from each other by the same distance they are from the eyes. The yellow-golden pile on the mesonotum extends to the base of the scutellum ; in front the mesonotum is much barer, probably through being rubbed. The scutellum is covered with a dull brownish down. The median segment is clothed with a short pale golden pubescence, especially on the middle above ; behind, it is hollowed slightly and in the middle is not so thickly haired as on the sides. The pro- and metapleuræ are covered closely with a short, the mesopleuræ with a still shorter, pale golden pubescence. Abdomen shining, pruinose ; the marks on the second segment are at the base at the sides and extend to the middle ; the fourth and fifth segments are only orange-yellow above ; the base of the sixth segment is orange in the middle. The femora and tibiæ are densely pruinose, appearing greyish ; the tarsi are bare. The recurrent nervures curve towards each other above, the first having a broader curve ; the third transverse cubital nervure is obliterated entirely, but both the recurrent nervures are present, the first being received shortly before the middle of the cellule.

Near *P. pictus*, Kohl.

Fam. Mutillidæ.

SPHÆROPTHALMA, Blake.

Sphærophthalma posticata, sp. n.

Long. 11 millim.

Hab. Mexico, Chilpancingo in Guerrero (*Höge*).

Allied to *S. pallene*, Cam., from Durango, but differing from it in having the black on the anterior part of the abdomen not continuous at the base, the black being triangularly narrowed in front and produced into a sharp point (instead of being incised) at the apex. The shape of the abdominal black mark is very like that of *S. toluca*, Blake, but that species differs from the present insect in many other respects.

Head a little narrower than the mesothorax, densely covered all over with long pale fulvous hair; black, below the eye largely rufous; the mandibles black, sparsely covered with pale hair. The thorax above broadly black, the black at the apex rounded. The median segment with an oblique slope; the pleuræ black, coarsely punctured, sparsely covered with long pale fulvous hair. The basal segment of the abdomen black, covered with long pale hair. The base of the second segment is black, with two pale orange marks, one on either side, the black band between them being broadly triangular in the middle; at the apex in the middle the black also projects a little; the apex of the second segment is broadly black at the side, the extreme apex in the middle being only narrowly banded with black; the third segment is broadly black at the sides. The ventral segments are covered densely with pale hair; the apices of the segments narrowly black. Legs black, densely covered with long white hairs.

Sphaerophthalma latebulteata, sp. n.

Ochracea, abdominis basi medioque late nigro-balteatis; pedibus nigris, longe albo-pilosis.

Long. 12 millim.

Hab. Mexico, Cordova and Jalapa in Vera Cruz (*Höge*).

Head distinctly narrower than the mesothorax, densely covered with long fulvous hair; the part behind the head roundly narrowed; the mandibles black, slightly rufous towards the middle; the antennal tubercles rufous at the apex. The antennæ black; the scape bearing long silvery hair, the flagellum with an obscure pale down. The thorax obliquely narrowed from the middle; above thickly covered with reddish-fulvous hair; the apex oblique, bearing large round deep punctures, and sparsely covered with long whitish hairs; the mesopleuræ coarsely punctured, sparsely covered with long whitish hair. The base of the abdomen bears long whitish hairs; the second segment with pale fulvous hair, the base broadly black, the base of the fulvous part roundly incised; the third and fourth segments covered all over with pale fulvous hair; the pygidial area black, the base and sides bearing long pale fulvous hair, longitudinally striolated. The ventral segments black, fringed with long pale fulvous hair, their apical half strongly punctured, the rest finely transversely striolated. Legs covered with long pale hairs; the apices black.

Agrees closely with *S. connectens*, Cam., from Chihuahua, but larger and stouter, the abdomen more abruptly narrowed,

more broadly black at the base, and with a broad black band towards the apex, *S. connectens* having only the base black; the legs, too, are more strongly haired.

Sphærophthalma chiron, sp. n.

Long. 18-20 millim.

Hab. Mexico, Venta de Zopilote (*H. H. Smith*), Acapulco in Guerrero (*Höge*).

This species has the general coloration of *S. ariadne*, Blake, but it is much larger. From *S. Cressoni*, Blake, it may be known by the central black mark on the base of the abdomen being completely separated from the smaller lateral black marks. In general coloration it agrees, too, with *S. ravula*, Cam., but the head in that species is quite differently formed.

Head distinctly narrower than the thorax, covered with pale golden pubescence, except on the oral region; the mandibles black. Antennæ black; the flagellum covered with a pale pile. Thorax narrowed abruptly behind and rounded in front; black, a broad band of pale golden in the middle above; the mesopleuræ covered with short silvery pubescence. The petiole covered with pale hairs. The second abdominal segment fulvous in the centre; extending from the base to near the middle is a black mark, longer than broad, gradually and slightly dilated to the apex, which is rounded; the sides of the segment black to the apex, and in their centre is a large black mark, rounded at the base, the apex more oblique; the third and fourth dorsal segments black, the black being at the base slightly oblique from the centre; the penultimate segment black at the sides; the pygidium black. The third to the fifth ventral segments densely covered with pale silvery hair; the last segments black. Legs densely covered with silvery hair.

Sphærophthalma myrmiciformis, sp. n.

Pallide aureo-pilosa, antennis pedibusque nigris. ♀.
Long. fere 12 millim.

Hab. Panama, Bugaba (*Champion*).

This species bears a great resemblance to the not uncommon Central-American ant *Camponotus sericeiventris*, amongst specimens of which it was placed in the box when received by me; but I know not if they are found together in nature.

The entire body covered with a silky depressed pale golden pubescence, shining; the head rather closely covered with

moderately long black hairs, the thorax and abdomen with longer and more sparsely distributed hairs. Antennæ black, thick; the scape covered with long black hairs, the flagellum with a microscopic down. Head large, wider than the thorax, developed behind the eyes to rather more than twice the length of the eyes; the mandibles sericeous and bearing some long black hairs. There is a black transverse band on the base of the mesonotum, one down the centre of the median segment and a narrower one down each of its sides. Abdomen not much longer than the thorax; its petiole short, obliquely raised from the bottom to the top. The ventral segments clothed, like the dorsal, with pale golden pubescence. Legs entirely black, sparsely clothed with longish black hairs.

S. myrmiciformis belongs to the group of *S. ocyroe*.

XXXV.—*A Contribution to the Osteology of the Mesozoic Amioid Fishes Caturus and Osteorachis*. By A. SMITH WOODWARD, F.L.S.

[Concluded from p. 297.]

II.—*OSTEORACHIS LEEDSI*, SP. N., FROM THE OXFORD CLAY OF PETERBOROUGH.

The unique specimen of *Osteorachis* in the Leeds Collection (Brit. Mus. no. P. 8388) comprises the hinder portion of the skull, fragments of the jaws, opercular apparatus, and pectoral arch, and part of the vertebral column, all undoubtedly belonging to one and the same individual. It is of interest not only on account of its gigantic size, but also as being the first known example of the genus of Upper Jurassic age. As its teeth are relatively larger and stouter than those of the typical species (*O. macrocephalus*) from the Lower Lias, while their enamelled apex seems to be shorter, the species it represents is evidently new, and may be named *O. Leedsi*, in honour of its discoverer. In the anterior half of the dentary in the Oxfordian fossil the length occupied by the bases of three consecutive teeth at least equals, and usually exceeds, the depth of the bone bearing them; whereas in *O. macrocephalus* the corresponding length is always less than the depth of the bone.

The following are some of the principal measurements obtainable:—

	m.
Width of occiput	0.20
Length from occiput to orbital rim.....	0.18
Maximum depth of hyomandibular	0.28
Width of upper end of ditto.....	0.09
Length of post-temporal	0.16
Depth of supraclavicle	0.20
Maximum width of ditto	0.05

Cranium.

The cranium has lost the rostral region, and the floor of the brain-case with the parasphenoid is broken into three pieces separate from the main mass. The hinder portion of the cranial roof is well-preserved and shown of two fifths the natural size in Pl. X. fig. 1. The right post-temporal (*p.t.*) and some of the vertebral elements (*h.c.*, *pl.c.*, *n.*) are crushed upon the occiput, which is thus a little obscured; but the characteristic narrow projecting portion of chondrocranium beyond the roofing membrane-bones is conspicuous. The parietals (*pa.*) are remarkably unsymmetrical, that of the right side being twice as broad as that of the left, and the former exhibiting only a small antero-lateral point, while the latter extends far forwards into the frontal by its corresponding process. Except on their overlapped hinder border these bones are entirely covered by a fine rugosity and tuberculation, but without any traces of enamel. The relatively large frontals (*fr.*) are approximately equal in maximum width, but that of the right side is narrowed behind, and their median suture is extremely wavy, with one large acute lobation just behind the interorbital region, and numerous small interdigitations in front, where the fossil is fragmentary and then terminates. Posteriorly the ornamentation is a little more sparse than that of the parietals, anteriorly it becomes much coarser, and there is a tendency to radiation towards the margin of the bone. The squamosals (*sq.*) are relatively large and form a symmetrical pair, each gradually tapering forwards as far as the exposed portion of the postfrontal (*pt.f.*), and then rapidly terminating in an anterior acute point. They are ornamented like the frontals, and exhibit a conspicuous narrow smooth area, widest behind and tapering forwards, close to the inner margin of the element. The postfrontal (*pt.f.*) is only exposed for a very small space on each side, and appearances suggest that the cartilaginous element itself is shown without any investing membrane-bone. There are no marks of regularly disposed sensory canals on any part of the roof.

The chondrocranium itself is imperfectly ossified, but when

viewed from below in the fossil (Pl. X. fig. 1 *a*) some of its characteristic features can be distinguished. The opisthotic (*op.o.*) is a well-formed bone, with the usual large oval foramen for the exit of the vagus nerve, and in front it clearly articulates by a wavy suture with the equally well ossified pro-otic (*pr.o.*), which is broken away anteriorly. The postfrontal or sphenotic (*pt.f.*) is also massive and distinct, with a very well-defined hinder border for union with the rest of the upper part of the otic capsule, which seems to have remained unossified, as in *Amia*. There may have been a granular calcification of the cartilage here, but nothing more. The ossifications and calcifications in the interorbital region of the chondrocranium are almost entirely broken away, but there are just traces of the interorbital septum (*s.*), showing the anterior production of the cerebral cavity for the passage of the olfactory nerves. On the left side of the fossil there are also indications of a robust prefrontal or ecto-ethmoidal ossification.

The imperfect separated basicranial axis cannot be fitted to the rest of the fossil, and the sutures between its component elements are not distinguishable. The robust parasphenoid is, indeed, firmly fused at least with the basioccipital. This basal membrane-bone exhibits a slight cleft behind and is expanded in front in the usual manner for squamous union with the vomers; it does not bear teeth, but there is an irregular bony excrescence a little behind the middle, where small teeth usually occur in allied fishes. The upper or cerebral aspect of the specimen is interesting on account of the configuration of the basioccipital. This bone is not curved upwards at the sides, but agrees exactly with the corresponding element of *Amia* in displaying a conspicuous median ridge, which looks like a distinct bone thrust into a cleft.

Jaws, Facial and Opercular Bones.

The hyomandibular is preserved on both sides, and one specimen is shown of two fifths the natural size from the inner aspect in Pl. XI. fig. 1. The bone is slightly more than twice as deep as its maximum width measured at the process (*p.*) for the support of the operculum; it is much laterally compressed, strengthened by a median longitudinal thickening, and by another extending from this along the base of the opercular process. The upper end was evidently capped with cartilage; the anterior margin, completely preserved in the fossil, is gently excavated, and below the opercular process behind there seems to have been an ex-

tremely delicate wing of bone probably of the form indicated by the dotted line in the figure. It is also interesting to note that the bone is pierced by a short vertical canal exactly as in *Amia*, the upper opening (*f.*) being on the inner, the lower opening on the outer face. The quadrate of the left side is nearly complete and is remarkable for the very large size of the articulation for the mandible, which is much elongated antero-posteriorly. The hinder margin is a little curved outwards and thickened, and remains of a tuberculated external plate are crushed upon this prominence. Of the pterygo-palatine arcade only fragments are preserved; but it may be said that these laminar bones bear clustered patches of teeth, which are small near the margin of the jaw and become merely minute tubercles or granulations beyond. One piece of bone, which seems to have been palatine, bears an irregular cluster of teeth as large as those of the splenial. The imperfect right maxilla (Pl. XI. fig. 2) shows that this element is very long and narrow, the dentigerous border being somewhat concavely arched and furnished with a single close series of large teeth, which are largest in the middle of the bone, and all seem to be approximately circular in transverse section. The outer face is very coarsely rugose and seems to have formed a little parapet outside the bases of the teeth, as indicated by a fragment behind, which is accidentally overlain by another piece of bone (*x*). There is some indication of a surface of overlap for the supramaxilla. The mandible is also remarkably long and slender, but is known only by the portion of the left ramus shown of two fifths the natural size from the outer and superior aspects in Pl. XI. figs. 3, 3a. The dentary (*d.*) bears a single close series of teeth still larger than those of the maxilla, but they are unfortunately only indicated by their bases, which are ovoid in shape, with the long axis coincident with that of the jaw. The outer face of the bone is coarsely and irregularly rugose, and its lower portion is a thin vertical lamina with an acute inferior border. The splenial (*spl.*) is comparatively robust and forms a broad ledge on which small teeth are irregularly clustered, but it is broken in front, and its precise extent is unknown.

Very few traces of the check-plates remain, and nothing is known of their arrangement. Like the other external bones, all are destitute of enamel on the tubercular or rugose ornament. A fragment of the anterior border of the left operculum is almost smooth, though with irregular surface.

Dentition.

The teeth are all simple hollow cones, and the internal cavity in the fossil is usually filled with calcite. They are rounded in section, without any longitudinal keels, and the slender apical portion alone is enamelled. The apex is more or less curved and usually marked only with very delicate striae, though one splenial tooth is crimped in the lower part of the enamel. The smooth brown base seems to have had a relatively thin wall in the larger teeth, judging from fractures by crushing, and one of the supposed palatine teeth shows a natural indent of its outer face at the attached end. All the teeth are fixed in shallow depressions and fused with the supporting bone, and the only complete tooth of the maxillary series seems to be worn (during the life of the animal) at the apex. No successional teeth are observable.

Axial Skeleton of Trunk.

The vertebral column is represented by 12 of the pleurocentra, 15 of the hypocentra, and a few fragments of the arches. As already mentioned, one pleurocentrum (*pl.c.*), one hypocentrum (*h.c.*), and one neural-arch-shaped fragment (*n.*) are crushed in the matrix at the occiput; the others are all detached. A typical pleurocentrum is shown of two thirds the natural size in end view and from the superior and lateral aspects in Pl. XI. figs. 4, 4*a*, 4*b*.

All the specimens are crushed and some much distorted, but that here represented seems to retain approximately its original form. It is not quite bilaterally symmetrical, one side being longer than the other, and in this respect it differs from the remainder of the series, which have a more regular figure. In end view five distinct facettes are observed. Between the two branches of the bone there is the smooth saddle-shaped surface (*not.*) which would be directly in contact with the persistent notochord; above this is a pair of small ovoid facettes of finely granulated aspect (*n.a.*), to support the basal segment of the neural arch, and each divergent branch bears a great rugose flattened surface, which would be apposed to the corresponding surface of the hypocentrum. When viewed from above (fig. 4*a*) the pair of facettes for the support of the neural arch is seen to occur on both ends of the bone, with a small intervening space, this indicating that the arches alternated with the vertebral bodies as in *Amia*. It is also noteworthy that a conspicuous little boss of variable development projects from the restricted area between each pair of these neural facettes. Inside view (fig. 4*b*)

the pleurocentrum appears as a very short bone tapering to its pointed lower end. The hypocentra are larger and more massive than the pleurocentra. A typical example from the abdominal region is shown of two thirds the natural size from the anterior, inferior, and lateral aspects in Pl. XI. figs. 5, 5 *a*, 5 *b*. The smooth saddle-shaped surface (*not.*) originally in contact with the persistent notochord is again conspicuous, and the great rugose surface on each branch of the bone resembles that of the pleurocentrum which it meets. The stout lower portion of the element is often a little distorted by crushing during fossilization, but it always exhibits a pair of small rounded depressions (*x*) in front and behind, as if they were facettes for some relatively small intercalated parts which have disappeared. When viewed from below (fig. 5) *a* the hypocentrum is seen to be flattened in the middle of the inferior face and marked with a slit-like pair of longitudinal depressions, while between this flattening and the transverse processes (*tr.*) the surface of the bone exhibits a slight concavity. The processes, seen also in side view (fig. 5 *b*, *tr.*), are very short and stout, and there is always a small irregular bony boss (*y*) at their base antero-inferiorly; in the specimen figured they are placed on the hinder half of the bone, the disposition of parts doubtless indicating that it belongs to the posterior abdominal region. The end of the lateral branch of the hypocentrum is rather truncated than pointed (fig. 5 *b*). Two detached hypocentra are exceptional in being much stouter in every way than the others, and are remarkable as exhibiting a pair of deep depressions in place of the usual transverse processes. Comparison with the partially obscured example crushed upon the back of the skull suggests that these belong to the most anterior part of the vertebral column.

Among the remains of vertebral arches the only satisfactory specimens are some detached bases of the neural elements. One of these, imperfect at its upper end, is shown of two thirds the natural size from the anterior and externo-lateral aspects in Pl. XI. figs. 6, 6 *a*, and the first figure is rendered more instructive by an outline restoration of its fellow of the opposite side. The specimen obviously belongs to the abdominal region. The bone is comparatively massive at the proximal end, and shows very clearly the facettes (*c*) for articulation with two contiguous pleurocentra. It meets its fellow of the opposite side in another considerable articulation (*a*) above the neural canal (*n.c.*), which is shown to have been remarkably small, and there seems to have been even another slight meeting below this canal. On the outer side of its base the bone bears a prominent little boss (*p.*), which is directed upwards and almost pointed.

Appendicular Skeleton.

Of the appendicular skeleton scarcely any parts are preserved, but the right post-temporal and supraclavicle are worthy of note. The post-temporal (Pl. X. fig. 1, *p.t.*) agrees in general characters with that of *Amia*, exhibiting the downward and forwardly directed process near the outer margin; but its hinder portion is relatively longer and narrower, with an almost spatulate end. There is an irregular rugose and tubercular ornament on its middle region. The supraclavicle is truncated above, with a concave facette about half its width. It is a gently arched laminar bone, about four times as deep as its maximum width, which is at the upper end. There is an irregular coarse rugosity on its exposed hinder half.

III.—*OSTEORACHIS MACROCEPHALUS*, FROM THE LOWER LIAS OF LYME REGIS.

The foregoing and other recent observations necessitate a few supplementary remarks on the fine example of *Osteorachis* from the Lower Lias of Lyme Regis originally described by Davis under the name of *Heterolepidotus grandis**. This specimen has lately been acquired by the British Museum, and its reference to the genus now under consideration can thus be verified by direct comparison with the type specimens.

The imperfect cranium in this unique fossil (Brit. Mus. no. P. 7797) is exposed from above, but the rostral end is wanting and the anterior half of the frontals is shown only in impression. The whole is much fractured, and is merely of interest as displaying the prominent tubercular ornament in the hinder region and the extremely wavy suture between the frontals where they begin to become smooth. The squamosal is lost on the right side, so that the original figure of Davis does not indicate the total width of the occiput. The jaws and facial bones are entirely wanting, and the appearances described by Davis as "lower jaws 5 inches in length" are better explained as a portion of clavicle crushed upon the branchial apparatus. Nearly all the remains below the skull, indeed, may be ascribed to the hyoid and branchial arches. The branchial bars are delicate and covered with the scattered gill-rakers in the form of minute enamelled denticles. These are especially interesting as being often clustered on

* J. W. Davis, "On *Heterolepidotus grandis*, a Fossil Fish from the Lias," Journ. Linn. Soc., Zool. vol. xviii. pp. 293-298, pl. vii. (1885). See also A. S. Woodward, "On the Liassic Fish, *Osteorachis macrocephalus*," Geol. Mag. [4] vol. ii. pp. 204-206, pl. fig. 10 (1895).

little triangular plates of bone, much like those of *Caturus* and *Amia*. In the description by Davis they are erroneously ascribed to the jaws. Just below and behind the head (scarcely indicated in Davis's figure) there is a fragment of the vertebral column clearly segmented into wedge-shaped pleurocentra and hypocentra, and one of the latter displays the short transverse process for the rib. The remainder of the axis is obscured by pyrites as far as the middle of the tail, where the overlapping scales and crushing are also detrimental to precise observation; but the pleurocentral and hypocentral ossifications in the hinder half of the tail are either comparatively feeble or absent. The upper caudal lobe is atrophied as much as usual in the Protospondylic fishes, and the caudal fin is quite normal. The supposed "second series of intermediate bones to which the fin-rays are attached" (Davis) are merely the short unjointed bases of the rays themselves. The fulcra on the upper caudal lobe are also quite normal, the "five prong-like rootlets" depending upon an error of interpretation. The well-preserved dorsal fin seems to exhibit "smaller intermediate" rays between its principal rays as the result of a little distortion by crushing; the right and left halves of the rays in question are evidently somewhat displaced, and that of the right side becomes exposed in posterior view just behind its fellow of the left side. This often happens in fossilized fishes. The well-preserved pelvic fin is interesting as showing for the first time in *Osteorachis* the biserial character of its slender fulcra. There are remains of large finely ornamented post-clavicular plates, and the characteristic squamation is very well preserved over the greater part of the trunk.

EXPLANATION OF THE PLATES.

PLATE VIII.

- Fig. 1.* *Caturus*, sp.; cranial roof, two thirds nat. size.—Oxford Clay; Christian Malford, Wiltshire. [B. M. no. 29049.]
Fig. 2. *Caturus*, sp.; anterior end of cranium, two thirds nat. size.—Oxford Clay; Peterborough. [B. M. no. P. 6902.]
Fig. 3. *Caturus*, sp.; head, right lateral aspect, two thirds nat. size.—Ibid. [B. M. no. P. 6907.]
Figs. 4, 4 a. *Caturus*, sp.; right maxilla and palatine, outer and inferior aspects, two thirds nat. size.—Ibid. [B. M. no. P. 6910.]
Fig. 5. *Caturus*, sp.; portion of gill-arches, two thirds nat. size.—Ibid. [B. M. no. P. 6906.]

a.o., antorbital; a.p., articular process of maxilla; ag., angular; br., branchiostegal rays; c.o., circumorbital; d., dentary; fr., frontal; gu., gular plate; mx., maxilla; na., nasal; occ., occipital border; pa., parietal; pl., palatine; pmx., premaxilla; amx.,

supramaxilla; *s.o.*, suborbitals; *scL*, sclerotic; *sp.o.*, supra-orbitals; *sq.*, squamosal; *t.*, bony tesserae; *a.*, dermal bone on ethmoid.

PLATE IX.

Figs. 1, 1 a. Caturus, sp.; suspensorium, mandibular, and hyoid arches, outer and inner aspect, two thirds nat. size.—Oxford Clay; Peterborough. [B. M. no. P. 6901.]

Fig. 2. Hypohyal of same specimen.

Fig. 3. Gular plate of same specimen, imperfect behind.

Figs. 4, 4 a. Nasal bones of same specimen, outer and inner aspects.

Figs. 5, 5 a, 5 b. Caturus, sp.; hypocentrum, anterior, lateral, and inferior aspects, nat. size.—Ibid.

ag., angular; *ar.*, articulation of mandible; *c.hy.*, ceratohyal; *c.o.*, circum-orbital; *cor.*, coronoid; *d.*, dentary; *ectp.*, ectopterygoid; *enpt.*, entopterygoid; *ep.hy.*, epihyal; *g.r.*, gill-rakers; *hm.*, hyomandibular; *lf.*, lower articular facet; *p.*, process of hyomandibular for operculum; *p.op.*, preoperculum; *qu.*, quadrate; *spl.*, splenial.

PLATE X.

Figs. 1, 1 a. Osteorachis Leedsi, sp. n.; hinder portion of cranium superior and inferior aspects, two fifths nat. size.—Oxford, Clay; Peterborough. [B. M. no. P. 8388.]

fr., frontal; *h.c.*, hypocentrum; *n.*, neural arch; *op.o.*, opisthotic; *p.t.*, post-temporal; *pa.*, parietal; *pl.c.*, pleurocentrum; *pr.o.*, pro-totic; *pt.f.*, postfrontal; *s.*, interorbital septum; *sq.*, squamosal.

PLATE XI.

Fig. 1. Osteorachis Leedsi, sp. n.; hyomandibular of type specimen, inner aspect, two fifths nat. size. *f.*, foramen; *p.*, process for support of operculum.

Fig. 2. Right maxilla of same specimen, outer aspect, two fifths nat. size. *a.*, bone-fragment.

Figs. 3, 3 a. Portion of left mandibular ramus of same specimen, outer and oral aspects, two fifths nat. size. *d.*, dentary; *spl.*, splenial.

Figs. 4, 4 a, 4 b. Pleurocentrum of same specimen, anterior, superior, and lateral aspects, two thirds nat. size. *not.*, surface for notochord; *n.a.*, facet for neural arch.

Figs. 5, 5 a, 5 b. Hypocentrum of same specimen, anterior, inferior, and lateral aspects, two thirds nat. size. *not.*, surface for notochord; *tr.*, transverse process; *d.*, depression; *y.*, bony prominence.

Figs. 6, 6 a. Right half of neural arch of same specimen, anterior and externo-lateral aspects, two thirds nat. size, the left half restored in outline in fig. 6. *a.*, median articulation; *c.*, facettes for pleurocentra; *n.c.*, neural canal; *p.*, prominence.

The numbers in square brackets refer to the Register of the Department of Geology in the British Museum, where the original specimens are preserved.

XXXVI.—On a new Dormouse from Mashunaland.

By OLDFIELD THOMAS.

MR. J. FFOLLIOTT DARLING, whose large collection of small mammals from Mazoe, Mashunaland, has just been described by Mr. de Winton*, has, now that the war is over, recommenced work at Enkeldorn, halfway between Salisbury and Buluwayo, whence he has sent to the National Museum a further small consignment of mammals. Among these there is one example of *Herpestes coffer*, one of *Georychus Darlingi*, and one of a dormouse which is clearly not the species he sent from Mazoe, but a much larger and quite distinct one, and which appears to be new. It may be called

Graphiurus platyops, sp. n.

Allied and fairly similar in external appearance to *G. murinus*, but rather larger and with a more bushy tail, of which the hairs are 25 to 28 millim. in length, and are brown, broadly tipped with white. In other external characters, colour, size and shape of ears, and character of fur, specimens of *G. murinus* may be found quite to match the new form.

Skull distinguished from that of *G. murinus*, as from that of every other known dormouse, by its remarkable flatness and breadth, which give it a most peculiar aspect. The flattening is most marked in the face, so that the vertical height from the palate to the nasion, measured with sliding calipers, is only 5·2 millim., as against 6·0 millim. in the smaller *G. murinus*. This difference of nearly a millimetre in height, combined with a greater breadth both of brain-case and zygomatic spread, makes a very material difference in the general aspect.

Looked at from above the muzzle appears broad and heavy, especially across the lacrymal region; nasals long; inter-orbital region narrow; brain-case broad and depressed; ante-orbital foramina widely open, molars small; palate ending opposite the back of m_3 . Bullæ low and flattened.

Dimensions of the type (an adult male), measured by the collector in the flesh:—

Head and body 106 millim.; tail 69; hind foot 23·3; ear 14·2.

Skull: basal length 26·6; basilar length from bensonion 24·2; zygomatic breadth 17; nasals $13 \times 3·6$; interorbital

* P. Z. S. 1896, pp. 798-808.

breadth 4·2; breadth of brain-case behind zygomata 14; interparietal 8·8 × 3·2; palate length from henselson 10; diastema 7·7; length of upper molar series 3·1.

Hab. Enkeldorn, Mashunaland.

Type: B.M. no. 97. 2. 16. 2. Collected by J. folliott Darling, Oct. 10, 1896, and presented by him to the British Museum.

XXXVII.—*Note on Deridea*, Westwood (Lyttidæ), with the Description of a new Species. By Mrs. M. K. THOMAS.

DERIDEA was described by Westwood as a new genus, which he referred with doubt to the family Helopidæ, probably through a mistaken conclusion that the claws were simple. Fairmaire*, in remarking on this, discusses the position that ought to be assigned to the genus, and observes that at the first glance it approaches *Nemognatha*, but differs by the claws of the tarsi being simple, and considers therefore it should be placed at the end of the Cantharidæ, leading up to the CEdemeridæ.

This is, however, an error on his part, as the claws really are divided, although not pectinated, as in *Nemognatha*.

Furthermore, from a supposed resemblance to an insect he terms *Leptura tenuicollis*, Fabr. (placed by Schönherr among the Zonitidæ), he throws doubt on the validity of *Deridea curculionoides* as a species. It is, however, quite different to the specimen labelled (and apparently correctly) *Zonitis tenuicollis* in Mr. Bates's collection.

Deridea notata, sp. n.

Head glabrous, anteriorly black, posteriorly dark rufous-coloured.

Antennæ black, delicate, slender, not very long. The first joint long, the second very short, the third equal to the first, the remainder gradually diminishing in length.

Prothorax bright rufous-coloured, elongated, widening posteriorly, glabrous, thinly punctured; no median line; slightly pubescent, with sparse white or pale yellowish hairs.

Elytra finely punctured, shining, with pale yellow or white pubescence; nerves marked, entirely rufous-coloured, with the exception of the posterior half of each elytron, along the outer edge of which there is a narrow black band.

* Ann. Soc. Ent. France, 1891, p. 265.

Underside and legs black, shining, pubescent, the abdominal segments bright rufous. Legs pubescent, rufous; knees, trochanters, and tarsi infuscated; claws reddish, divided, but not pectinated.

Length 10, breadth 4 millim.

Hab. Lahej, near Aden. Collected and presented by Col. J. W. Yerbury.

This species differs from *Deridea curculionoides* chiefly in its colouring (which is almost entirely rufous), in having no median line down its prothorax, and in not being so glabrous, but more pubescent.

There is a second specimen from the same locality in the collection differing slightly from the type in the colouring of the head and underside, which is entirely rufous, without any black at all.

XXXVIII.—On a Collection of *Heterocera* made in the Transvaal. By W. L. DISTANT.

Fam. Saturniidae.

I obtained a very fair collection of these fine moths during my last three years' sojourn in the Transvaal, and my success was principally owing to the electric lamps which now light Pretoria, and did not do so when I first visited the country. In fact, I think I may state that all my specimens of Saturniidae were taken at light. These huge moths strike against the glass and fall to the ground, when they may be picked up; a net is seldom required, and specimens may often be taken in the early morning which have not sufficiently recovered from the collision of the previous night.

In the following enumeration I have only referred to the specimens obtained in the Transvaal, and have added notes on variation and described two new species. Where not otherwise specified, the captures were my own.

Species obtained in the Transvaal.

Epiphora mythimnia, Westw. Barberton (Dr. P. Rendall and J. R. Harrison).

Bumea angasana, Westw. Pretoria.

Gonimbrasia pygela, Druce. Pretoria.

Antheraea arabella, Auriv. Pretoria, Middelburg.

— *arata*, Westw. Barberton (J. R. Harrison).

— *cytherea*, Fabr. Pretoria.

— *belina*, Westw. Pretoria.

Antheræa menippe, Westw. Barberton (*Dr. P. Rendall*).

— *tyrrhea*, Cram. Pretoria.

— *bracteata*, sp. n. Pretoria.

Gynanisa maia, Klug. Barberton (*Dr. P. Rendall*), Pretoria, Lydenburg.

Cirina forda, Westw. Barberton (*Dr. P. Rendall*), Pretoria.

— *similis*, sp. n. Pretoria.

Heniocha flavida, Butl. Pretoria.

— *dyops*, Maass. & Weym. Pretoria.

Variation.

So great is the variation of markings in these moths that, had I not possessed a reasonable series, I must have inevitably either failed to identify some of the species, or have been led to describe them as new. This variation consists principally in the relative position of the transverse fasciæ to the anterior wings (*Antheræa*) and the position of the ocellated spot to the posterior wings (*Buncea* and *Antheræa*). The first is so strikingly dissimilar that had I not the same variation in two different species, I should have considered it of a specific and not varietal character. It is also probably not a case of seasonal dimorphism.

Buncea angasana.

Saturnia angasana, Westw. Proc. Zool. Soc. Lond. 1849, p. 52. n. 19; Ang. Kaff. Ill. t. xxx. fig. 16 (1849).

This species is not unreasonably considered by Mr. Rothschild (Nov. Zool. vol. ii. p. 39) to be an aberration of *B. caffraria*, Stoll. It is, however, in my experience the only form in the Transvaal, where I have never met with *B. caffraria*, which is common enough in the Cape Colony and Natal. There can be no doubt as to the close alliance of the two species (?), and breeding must decide the point. All my specimens of *B. angasana* are also larger than *B. caffraria*. In both forms or species (?) the usual position of the ocellated spot on the posterior wings is in more or less connexion with the outer transverse fascia. In one of my specimens of *B. angasana* the spot holds a discal or central position.

Gonimbrasia pygela.

Buncea pygela, Druce, Proc. Zool. Soc. Lond. 1886, p. 409, t. xxxviii. fig. 1.

Mr. Druce's description and figure are evidently taken from a somewhat rubbed specimen. In fresh examples the whole surface of the anterior wings is bright pinkish brown, save the outer margins, which are indistinctly violaceous. The

posterior wings are very bright orange-yellow, the outer margin pale violaceous, with the fringe pink.

Antheræa menippe.

Saturnia menippe, Westw. Proc. Zool. Soc. Lond. 1849, p. 43. n. 6, t. ix. fig. 2.

Mr. Rothschild (*l. c.* p. 43) has described a form of this species from Taveta as *A. (N.) menippe fumosa*, subsp. nov., in which the colour is "smoky brown all over, instead of dull crimson." In Barberton specimens taken at the same time the outer margins of the wings are either pale ochraceous or smoky brown.

Antheræa belina.

Saturnia belina, Westw. Proc. Zool. Soc. Lond. 1849, p. 41. n. 4, t. viii. fig. 2.

This species is evidently of a most variable character. Mr. Rothschild (*l. c.* p. 42) has included the form *A. (N.) Huebneri*, Kirby, as a synonym, and I should have considered the large male, I now describe as a variety, rather as possessing all the characters of a distinct species, had not a similar aberration occurred with *A. cytherea*.

Var. α (δ).—Larger than the ordinary form, of which I obtained examples at Pretoria. Anterior wings with the transverse fasciæ much wider apart. Posterior wings with the ocellated spot on disk, and somewhat widely separated from the submarginal fascia.

This cannot be considered a seasonal form, having been taken at Pretoria in November, and the normal form of the species on the 30th October.

Antheræa cytherea.

Bombyx cytherea, Fabr. Syst. Ent. p. 557. n. 5 (1775).

This variable species, not included in Mr. Rothschild's list of species of the genus (*Nudaurelia*, Rothsch.), is well known to vary greatly in hue, as a long series now before me amply testifies. From Pretoria I obtained normal specimens, but also a very large male exhibiting the aberration described in the last species.

Var. α (δ).—Much larger in size than ordinary forms of the same sex. Anterior wings with the transverse fasciæ very much wider apart. Posterior wings with the ocellated spot more removed from the submarginal transverse fascia.

Taken with typical forms in February at Pretoria.

Antheraea bracteata, sp. n.

Wings, body above and beneath, and legs bright golden yellow; antennæ brownish ochraceous, with the apical joints (excluding extreme apex) blackish.

Anterior wings at about one fourth from base crossed by a single waved, transverse, plumbeous fascia, a similarly coloured but more pronounced transverse fascia at about one third from outer margin, and faint indications of a similar submarginal fascia. At end of cell are faint indications of a bright ocellated spot beneath.

Posterior wings with a large ocellated spot at end of cell, plumbeous, with a small grey centre and a bright black outer margin, and with two plumbeous outer transverse fasciæ—one submarginal and the other at about one fourth from margin.

Wings beneath with the fasciæ almost obliterated; anterior wings with a bright black ocellated spot centred with greyish at end of cell, and posterior wings with the spot above almost obliterated beneath.

Exp., ♂ 135 millim.

Hab. Transvaal, Pretoria (*Distant*).

This species, which seems to be nearest to *A. (Nudaurelia) aurantiaca*, Rothsch., is not only very distinct in coloration and markings, but has the peculiarity in the ocellated spots, that in the anterior wings they are very distinct beneath and almost obliterated above, while in the posterior wings the process is reversed, being brightly pronounced above and very indistinct beneath.

Cirina similis, sp. n.

Closely allied to *C. forda*, Westw., but differing structurally by the larger size of both sexes, and by the females showing no angulation on the posterior margin of the hind wings, which is plainly seen in *C. forda* ♀. Other differences are found in the ocellated spot of the posterior wings being much more discal and therefore less contiguous to the transverse fascia.

Exp., ♂ 117, ♀ 110–128 millim.

Hab. Transvaal, Pretoria (*Distant*).

I took both this species and *C. forda* in Pretoria, and, allowing for all the undoubted variation in Saturniidae, am compelled to separate them specifically.

The British Museum possesses a female specimen from Gambia.

*Heniocha dyops.**Saturnia dyops*, Maass. & Weym. Beitr. Schmett. ii. fig. 21 (1872).

I acquired a fair series of specimens of this species at Pretoria, and found it to be very variable in markings. One specimen agrees with the typical figure in having the ocellated spot of the anterior wings connected with the transverse fascia; in all other specimens they are more or less widely separated. The discal spot to the posterior wings is sometimes very distinct, or absent on one wing, or totally wanting on both; the inner transverse fascia to the same wings is either complete or sometimes abbreviated.

I have not seen the type of *H. marnois*, Rogenh., but from the description think it is but a varietal form of *H. dyops*; and as Mr. Rothschild is inclined to unite Rogenhofer's species with *H. bioculata*, Auriv., there must, if my surmise is correct, be considerable synonymy among the species of the genus.

XXXIX.—*Contributions from the New Mexico Biological Station*.—V. *Some new Hymenoptera from the Mesilla Valley, New Mexico*. By T. D. A. COCKERELL.

*Apidæ.**Centris calypinæ*, sp. n.

♀.—Length 15–18 millim.

Black; head and thorax with pale ochraceous pubescence, short and very dense on thorax, clypeus and sides of front bare. Eyes, clypeus, labrum, and basal three fifths of mandibles crimson. Clypeus shining, very sparsely punctured. Mandibles truncate at tips and with four denticles, alternating large and small, on inner side. Some very long hairs spring from near the base of the mandibles beneath. Antennæ black, the end of the scape slightly tinged with rufous. Front very broad, inner orbits parallel. Tegulæ whitish. Wings smoky hyaline, nervures and stigma fuscous, third submarginal cell narrowed more than half to marginal, no distinct stump of a nervure springing from lower outer corner of third submarginal. Legs black or dark piceous, with black pubescence, and more or less pale brownish pubescence on the four anterior legs; hind tibiae and basal joint of tarsi broadly dilated, with dense black hairs. Claws large, rufous at base, seeming to be entire, but

when seen from above a small denticle is visible on the inner side. Abdomen almost bare, what little pubescence there is is black, except some pale pubescence at base of first segment. Apex with very dark blackish-brown hairs. Pygidium rufescent at base, narrow at end, longitudinally sulcate on each side.

♂.—Length 16 millim.

Eyes olive-green; clypeus and labrum bright lemon-yellow; scape wholly dark; mandibles dark reddish brown, with black tips; claw-joints rufous; legs with more pale pubescence; hind femora broad, the pubescence without pale, except at end. Apex of abdomen with pale hairs.

Var. nov. *rhodopus*.

♀.—Length 12–13½ millim.

Scape rufous in front; mandibles sharp at tip; femora and tibiae rufous. Segments 2 and 3 of abdomen with narrow lateral pale hair-bands on hind margin.

♂.—Length 11½–12½ millim.

Scape yellow in front. Mandibles more or less yellow without. A small yellow spot on each side between clypeus and orbital margin. Legs more or less rufous. Hind femora with the long hairs on outer side white, strongly contrasting with the spreading black hairs of the first tarsal joint. First segment of abdomen covered with pale almost silvery pubescence. Segments 2 to 4 with lateral apical white bands, that on 2 becoming very broad at the side. Wings clear.

Hab. Mesilla Valley, New Mexico. A typical female was taken by the late Mr. S. Steel at Las Cruces, May 17, some years ago. This year, on May 18, I caught on the College Farm, at flowers of *Casalpinia falcaria*, 3 ♀, 1 ♂ of the type, and 2 ♀, 2 ♂ of the var. *rhodopus*. It is probable that the var. *rhodopus* represents a distinct species.

Centris Hoffmanseggiae, sp. n.

♂.—Length 12 millim.

Black, with white pubescence, that on thorax above tinged with ochraceous. Eyes greyish, front narrow, hardly as broad as an eye, scape wholly black; clypeus, a line above transversely, labrum, and basal portion of mandibles yellowish white. Mandibles rufous at the junction of the white with the black ends; a strong inner denticle. Clypeus bare, with sparse shallow punctures. Pubescence of thorax dense. Tegulae reddish testaceous. Wings hyaline, nervures and

stigma piceous. Third submarginal narrowed about one half to marginal. A dark shade looking like a stump of a nervure at lower outer corner of third submarginal. Pubescence of legs wholly pale, hind legs not dilated, the white hairs long on outer side, but not forming a broad dense mat, as in other species. Claw-joints and basal half of claws rufous. Claws deeply bifid. Abdomen with short greyish-white pubescence, tolerably dense on first two segments, sparse on the others, giving way to fuscous on 4 and 5, but the hind margins with narrow thin white hair-bands. Apex with white hairs.

♀.—Length 12–14 millim.

Very much like the female of *cæsalpinia*, with the same broad black brush of hairs on the hind legs, the same black abdomen, &c. The thoracic pubescence averages paler than in *cæsalpinia*. Eyes grey. Clypeus and labrum dull orange-yellow, the upper corners of the clypeus more or less black, frequently the whole upper margin of the clypeus broadly black. Scape wholly black. Mandibles rufous, with black ends and base. Pubescence of abdomen very sparse and black, first segment sometimes with pale pubescence, but never the second. Claws small, with a little tooth within. Wings smoky hyaline. Front broad, inner orbits parallel.

Hab. College Farm, Mesilla Valley, N. M., at flowers of *Cæsalpinia falcaria*, May 18, 1896, 1 ♂, 7 ♀.

I had at various times swept over the flowers of *Cæsalpinia* (*Hoffmanseggia*) *falcaria*, var. *stricta* (Benth.), without getting any bees, and had wondered why this was. But on May 18 I observed that they were indeed visited by bees of the genus *Centris*, which were much too agile to be caught by sweeping. The *C. cæsalpinia*, in its typical female, was especially hard to catch, hovering over the flowers with a curious swinging motion, darting away at the least alarm. It was interesting to find several species of *Centris*, a neotropical genus with only one hitherto recorded U.S. species, at flowers of *Cæsalpinia*, a typically tropical genus of plants.

When I came to arrange all the specimens of *Centris* caught in the Mesilla Valley, I found I had four different males and four different females, presumably belonging to one another. The females are much alike, but the males present wider differences; and while I think I have the sexes properly associated, it must be admitted that there is a certain probability of error. Three of the forms—*cæsalpinia*, *rhodopus*, and *Hoffmanseggia*—are described above. The fourth is *C. lanosa*, Cresson, originally described in 1872 from three males caught by Belfrage in Texas. Cresson's description is

inadequate, but I have a male from Las Cruces collected by Prof. C. H. T. Townsend, and identified as *lanosa* by Mr. Fox. I also have a male of the same collected by Mr. Alfred Holt on the College Farm, May 2, 1895. I associate with these male *lanosa* four females—one on *Cæsalpinia falcaria*, May 18, 1896 (*Ckll.*), two on mesquite, May 13, 1895 (*Alfred Holt*), and one caught on May 17 by the late Mr. S. Steel, all from the Mesilla Valley.

The following notes on *lanosa* will be found useful :—

Centris lanosa, Cr.

♂.—This resembles the male of *cæsalpinix*, var. *rhodopus*, in size, general structure, and appearance, and differs at a glance from the male of *Hoffmanseggia*; but it is distinguished at once from *cæsalpinix* or its var. *rhodopus* by its narrow front, in which character it is like the male of *Hoffmanseggia*. The clypeus is yellow and the eyes are green, as in *rhodopus*, but the clypeus is necessarily narrower, owing to the shape of the face. The first segment of the abdomen is covered with pale hairs, but the other segments show no pale hair-bands. The hairs at the tip of the abdomen are dark or, at most, slightly pallid, not conspicuously pale as in *cæsalpinix* and *rhodopus*. The scape in my examples is dark, though Cresson's description reads otherwise.

♀.—I had mixed what I now consider to be female *lanosa* with female *Hoffmanseggia*, and probably would not have separated them but for the necessity of finding females for the very different males of these species. The female *lanosa*, however, average decidedly larger than the *Hoffmanseggia*, and the second abdominal segment, as well as the first, is delicately pruinose. The claws also are noticeably larger and the black upper margin of the clypeus is broader, so that the yellow or orange is reduced to the shape of a half-circle.

The following tables may be found convenient :—

Females.

Clypeus crimson	1.	
Clypeus yellow or orange, its upper border more or less black	2.	
1. Length over 14 millim.; legs black		<i>cæsalpinix</i> , Ckll.
Length under 14 millim.; femora and tibiae rufous		<i>rhodopus</i> , Okll.
2. Second abdominal segment pubescent		<i>lanosa</i> , Cr.
Second abdominal segment bare		<i>Hoffmanseggia</i> , Ckll.

Males.

Front broad	1.
Front narrow	2.

1. Length over 14 millim.; scape without yellow *causalpinæ*, Ckll.
 Length under 14 millim.; scape yellow in front *rhodopus*, Ckll.
2. Abdomen with narrow hair-bands; clypeus yellowish white *Hoffmanseggiae*, Ckll.
 Abdomen without hair-bands; clypeus lemon-yellow *lanosa*, Cr.

Mr. Fox has suggested (Proc. Cal. Ac. Sci. 1893, p. 22) that *lanosa* is very likely identical with *mexicana*, Smith. *C. mexicana* was described from a female, which is at all events quite different from that which I have here referred to *lanosa*. I am much indebted to Mr. L. O. Howard for sending me copies of a number of descriptions of *Centris* to which I had not access.

Perdita perpulchra, Ckll., 1896.

This species was described from the female only. The male is new. It is slightly smaller than the female, and the light markings are all lemon-yellow. The face is all yellow beneath the level of the antennæ, except the usual clypeal dots and a little black round the dog-ear marks; supra-clypeal mark much broader than long, extending only as far as lower level of antennal sockets, while the lateral marks end broadly at the higher level. Cheeks unarmed. Eyes sage-green. Scape wholly yellow. Prothorax with less pale colour, but the hind margin continuously yellow. Metathorax bluer. Hind femora black above, except terminal fourth. First segment of abdomen with more black; bands on remaining segments reduced, more or less broken into spots. Apex yellow, inclining to orange. Venter yellow, with a series of transverse black patches.

Hab. College Campus, Mesilla Valley, N. M., on *Verbesina encelioides*, Sept. 16, 1895 (*Miss MacGilmore*).

In my key to the species of *Perdita* (Proc. Ac. Nat. Sci. Philad. 1896, p. 48) this will fall in with *sphaeralceæ* ♂, from which it is readily distinguished thus:—

- Stigma margined with brown; venter of abdomen immaculate in middle *sphaeralceæ* ♂.
 Stigma pale orange, not margined with brown; venter with a series of large black patches down the middle. *perpulchra* ♂.

Perdita erigeronis, sp. n.

♂.—Length $4\frac{1}{2}$ millim.

Head tolerably large, cheeks unarmed, bearded with white

hairs; colour of head dark green, face below antennæ wholly bright lemon-yellow, the yellow sending a short rather broad projection upwards in the median line, and laterally extending to the same level on the orbital margin, just to the lower end of the anteorbital pit, broadly, obliquely truncate as in *affinis*. A small projection passes from the lateral marks over the bases of the antennæ. Cheeks dark, but a narrow yellow stripe passes halfway up the orbital margin. Vertex very distinctly granular. Scape yellow, with a black stripe above; funicle yellow below, black above; flagellum dark brown, more or less yellow beneath. Thorax dark green, minutely sculptured and rather dull; metathorax dark blue. The metathorax may be also green, but then of a bluer green than the mesothorax. The pleura may become bluish. Mesothorax with sparse punctures, parapsidal grooves distinct. Pubescence of thorax sparse, tinged with ochreous on dorsum. Legs black; knees, stripe on anterior femora, anterior and middle tibiæ and tarsi in front yellow. Tubercles and two patches on hind border of prothorax yellow. Pleura wholly dark. Wings hyaline, iridescent, nervures and stigma dark sepia-brown; stigma hyaline in middle, third discoidal cell distinct; marginal cell appendiculate, its post-stigmatal portion about as long as the substigmatal; second submarginal narrowed about half to marginal. Abdomen piceous, with bright yellow clean-cut bands, interrupted in the middle, on the first three segments. The degree of interruption is variable and the band on the third segment may be reduced to two narrow stripes. Extreme tip of abdomen orange-brown. Venter dark.

Hab. Three males on flowers of *Erigeron divergens* (det. E. O. Wootton) at the Woodlands Orchard, Mesilla, N. M., May 9, 1896.

This greatly resembles the male of *P. affinis*, but is smaller and undoubtedly distinct. I am now persuaded that what I considered to be the male of *P. rectangulata* really belongs to *affinis*. *P. erigeronis* also resembles *P. fallax*, but that has white abdominal marks. It is, moreover, a vernal species, while *fallax*, *affinis*, and other allied forms are autumnal.

On the *Erigeron*, at the same place and time, I took one *Augochlora pura*, Say, ♀, and an *Halictus*.

Podalirius Lesquerellus, sp. n.

♂.—Length about 14 millim.; width of abdomen 5 millim.; length of anterior wing $8\frac{1}{2}$ millim.

Stoutly built, black, the pubescence short, close, delicate

grey, tinged with ochraceous on the metathorax, white on the face and underside of body. Clypeus except its lower margin, labrum except its lower margin, and lateral face-marks primrose-yellow. Lateral marks triangular, rapidly narrowing above on orbital margin. Anterior edge of labrum with a small round notch. Pubescence of face dense. Mandibles wholly black, with a large denticle on the inner side. Antennæ black, scape chrome-yellow in front, first joint of flagellum very long. Eyes olive-green. Thorax densely pubescent, scattered black hairs mixed with the pale ones, as is also the case on vertex. Tibiæ and tarsi grey pubescent on outer side; hind femora with long hairs, black and white intermixed. Last joint of middle tarsus with a very broad brush of black hairs on each side, the outline of the two brushes together making about a circle. Claws rufous, with black ends, deeply cleft. Tegulæ piceous; wings hyaline, marginal cell appendiculate. Abdomen with the first segment densely pubescent, the others with only short bristles, which do not conceal the surface. Hind margins of second and following segments narrowly testaceous. Apex truncate, very broadly and shallowly emarginate. Ventral segments with thin bands of white hairs.

Hab. Little Mountain, Mesilla Valley, N. M., three on flowers of *Lesquerella Fendleri*, April 1, 1895 (*Jessie Casad*); College Farm, Mesilla Valley, one on *Lycium*, April 16, 1895 (*Jessie Casad*).

Of the species found in the Mesilla Valley this most resembles *A. (P.) urbana*, Cr., which I have taken on *Solanum* at Las Cruces, July 13, the specimen having been determined by Mr. Fox. It is distinguished at once from *urbana*, however, by the black brush on the middle tarsi. It agrees with nothing in Dours's monograph, but is evidently close to *Anthophora Crotchii*, Cresson, from which it differs by its dark mandibles, colour of pubescence, &c.

Alcidamea biscutellæ, sp. n.

♂.—Length about 18 millim.

Rather stoutly built; in size, colour, pubescence, and general appearance much like *Andrena electrina*, which occurs in the same vicinity. Black, pubescent, the pubescence white, becoming mouse-grey on dorsum. Head somewhat broader than long, face covered with long silky white hairs, which radiate from the centre; vertex sparsely hairy in middle, bare at sides, shining, strongly punctured; mandibles black; antennæ black, scape gradually broadening to

the end, flagellum not so stout proportionately as in *A. producta*, last joint coming to a curved point, all the joints flattened. Cheeks and occiput quite hairy, occipital hairs greyish. Dorsum of thorax with erect, rather thin grey pubescence; mesothorax and scutellum shining, strongly punctured. Metathorax smooth and shining at base; pleura with long white hairs. Legs black, with white hairs. Claws rufous, with black tips, which are bifid, the inner denticle being shortest. Tegulae shining piceous; extreme base of wings rufescent. Wings hyaline, marginal cell and outer margin broadly smoky. Nervures and stigma piceous, second submarginal cell very long. Marginal cell more pointed than in *A. producta*. Abdomen strongly punctured, black, with thin greyish-white pubescence, hind margins of segments with narrow continuous white hair-bands. Hind margin of fifth ventral segment excavated roundly, with a broad conspicuous brush of appressed tawny hairs. Tip of abdomen strongly tridentate, the teeth widely separated, the middle one longest and narrowest, the lateral ones obliquely truncate. The lateral teeth are much more developed than in *A. producta*.

Hab. Close to the Agricultural College, Mesilla Valley, N. M., on *Biscutella Wislizenii*, April 20, 1896 (*Prof. E. O. Wooton*).

A very distinct species, much larger than *A. producta*, which it most nearly resembles in the apex of the abdomen.

Chrysididae.

Chrysis bigelovici, sp. n.

Length about 5 millim.

Deep blue, with green reflections; occiput, anterior margin of mesothorax, postscutellum, metathorax, and margins of abdominal segments more or less purple. Punctures large and close, somewhat smaller on abdomen than on thorax. Basin of face minutely punctured; sides of face and a transverse patch above the antennae with glittering white pubescence. A transverse carina on front, somewhat angled in the middle. No tubercles on vertex. Scape and funicle green; flagellum piceous, the first three joints white beneath, with short silvery pubescence. Parapsidal grooves strongly curved. Lateral tooth of metathorax long. Tegulae with an elongate white patch. Wings hyaline, nervures piceous. Knees, bases of tibiae, and tarsi more or less white, nearly the basal half of hind tibiae white, terminal joints of tarsi

fuscous. Abdomen with only the faintest indication of a median ridge on second segment; covered bases of segments black. Margin of third segment strongly bidentate, the notch between the teeth broad and deep, the teeth large, the margin beyond them gently curved, nearly straight, not angled, narrowly white. Pits about sixteen in number.

Hab. Las Cruces, New Mexico, on *Bigelovia Wrightii*, Sept. 23, 1895.

Structurally this is almost exactly like *C. mesillæ*, but it shows none of the crimson colour of that insect, and the parapsidal grooves of *mesillæ* are almost straight. It resembles also *C. perpulchra*, Cr., but that has the basin of face cross-striated, and *C. quadrituberculata*, Cam., but that has tubercles on the vertex.

Pemphredonidæ.

Ammoplanus salicis, sp. n.

♀.—Length about $4\frac{1}{2}$ millim.

Shining black, naked, with brilliant-silvery pubescence on face and cheeks and very sparse short pubescence on pleura and abdomen. Head large, quadrate, broader than long. Eyes converging below, front rather sparsely punctured, median groove very distinct, scape yellow in front, funicle yellow at extreme apex, flagellum piceous black. Anterior median edge of clypeus broadly truncate, the truncation with a notch on each side. Mandibles black at extreme base, rufous at tips, otherwise white, with a conspicuous denticle on the inner side, perhaps a little nearer to the base than the apex. Mesothorax rather sparsely punctured, scutellum obscurely punctured, tubercles with a yellow spot, basal middle of metathorax smooth. Knees, anterior and middle tibiæ except a black stripe behind, basal two fifths of hind tibiæ, and basal joints of tarsi cream-colour or very pale yellow. Ends of tarsi rufescent. Tegulæ dark testaceous. Wings hyaline, nervures and stigma black. Marginal cell about or nearly as long as first (and only) submarginal, but not so broad, its apex broadly truncate. Recurrent nervure joining marginal cell at its middle. Abdomen rather small, punctures minute and scattered, first segment smooth. Pygidium with strong sparse punctures.

Hab. Las Cruces, New Mexico, on *Salix*, May 2, 1896.

The silvery hairs of the face are broad and flattened, representing the first advance towards plumosity. A smaller species of *Ammoplanus* is found at Santa Fé.

Chalcididae.

Spilochalcis mesillæ, sp. n.

♀.—Length about 7 millim. or slightly over.

Head and thorax bright yellow, marked with black and a little rufous; first four legs yellow; abdomen (except the yellow petiole) and hind legs bright orange-rufous. Head with obscure shallow punctures; thorax with large punctures, largest and closest on scutellum, which becomes almost subcancellate; mesonotum transversely striate, the striæ much stronger and amounting to grooves in the middle; scutellum unarmed; abdomen smooth and shining, hind femora duller but smooth; petiole short, not half length of hind coxæ; hind femora with 16 minute teeth. Abdomen rather long, pointed, exclusive of petiole about as long as head and thorax. Antennæ black, funicle rufescent, scape yellow in front; occiput black, sending a black line forward between the ocelli to enlarge to a broad black frontal band, extending down to the antennal sockets. Mandibles bifid at apex, which is black. Thorax with a black median band running its whole length antero-posteriorly, pinched at hind margin of pronotum; on pronotum a little and on mesonotum in front broadly bordered with rufous. Thoracic sutures narrowly black; sides of metanotum with an elongate patch, black in front, rufous behind; anterior part of pleura black; middle coxæ marked with piceous; hind coxæ with a broad black stripe on outer side; femoral teeth darkened, but no marks on hind femora; abdomen immaculate, ovipositor slightly projecting, black.

Hab. Las Cruces, N. M., near to the Agricultural College, on *Bahia* or some similar Composite, Oct. 5, 1895.

A very pretty species.

XL.—*Descriptions of further new Species of Butterflies from the Pacific Islands.* By H. GROSE SMITH, B.A., F.G.S., F.Z.S.

Delias callistrate.

Male.—*Upperside.* Anterior wings white, with the apex broadly greyish black, the black apical area extending from the costa at one third from the apex, thence narrowing across the disk to a little below the lowest median nervule on the outer margin, base and costal margin narrowly grey; near

the apex are two rather large white patches, with an indication of a smaller patch above and another below them. Posterior wings with a marginal black band extending from the anal angle to the lowest subcostal nervule.

Underside. Anterior wings white, with the costal and apical areas more broadly black; in the black apical area are situate five spots, of which the three uppermost are yellow, the two nearest the costa are oval, the second being the largest, the third is more conical, the two lowest spots are nearer the margin and whiter and smaller. Posterior wings bright yellow, inclining to orange towards the anal angle, with the marginal black band wider than on the upperside, in which are situate five yellow subconical spots, the spot nearest the anal angle almost obsolete and the spot nearest the apex merging into the yellow area.

Female.—Upperside. Both wings white, with the black costal and marginal bands much wider than in the male, and on the anterior wings extending broadly along the outer margin to the inner margin at about one fourth from the outer angle; the white subapical patches on the anterior wings as in the male.

Underside nearly as in the male, but all the spots are yellow, with an additional spot in the black apical area of the anterior wings, and on the posterior wings the yellow area is shaded with white and the yellow spots are larger and more conical.

Expanse of wings $2\frac{1}{4}$ inches.

Hab. Fergusson Island (*Meek*).

In the collections of the Hon. Walter Rothschild and Mr. Grose Smith (types male and female).

Nearest to *Delias Georgiana*, Grose Smith, *D. Jobiana*, Oberth., and *D. sacha*, Grose Smith.

Delias caliban.

Male.—Upperside does not differ from *D. ladas*, Grose Smith.

Underside. Anterior wings differ from those of *D. ladas* in the black area being more extended, only the basal two thirds of the cell and the space below it to the inner margin being white, the white area extending obliquely over the lower part of the disk, but ceasing on the inner margin before the outer angle. Posterior wings black, with the basal third densely irrorated with yellow scales from the costal margin at one third from the base, thence transversely across the cell to the inner margin a little above the anal angle; the yellow subapical

spots on both wings are almost identical with those on the underside of *D. ladas*.

Expanse of wings $2\frac{1}{2}$ inches.

Hab. Fergusson Island (*Meek*).

In the collection of the Hon. Walter Rothschild.

D. caliban is a much larger insect than *D. ladas*; the irrorated yellow basal area on the underside of the posterior wings is a very distinct feature, apart from other differences.

Two examples were in the collection.

Delias maga.

Male.—Upperside. Anterior wings white, with costal margin narrowly and apical third very broadly black, the black area extending obliquely across the disk and narrowing to below the lowest median nervule, thence becoming linear to a little below the submedian nervure; two small clusters of white scales a little before the apex. Posterior wings with a black outer marginal band nearly three times as broad as in *D. mysis*, Fabr., and other allied species or varieties.

Underside. Anterior wings with the black area as on the upperside, in which a little before the apex is a row of five spots, of which the three upper spots are the largest, situate obliquely and coloured yellow; the two lower spots are white and smaller and narrower; base tinged with yellow. Posterior wings with a very broad marginal black band, sinuate on its inner edge, and extending over the outer third, in which is a row of seven contiguous red spots or lunules, rather narrower than in *D. mysis* and *D. lara*, de Haan, which traverses the black band at about one third from the outer margin; the basal half of the wings bright yellow, the yellow area extending over the whole of the cell and below it until reaching the black band.

Expanse of wings $2\frac{1}{2}$ inches.

Hab. Sud-Est, British New Guinea (*Woodford*).

In Mr. Grose Smith's collection.

Closely allied to *D. mysis*, *D. lara*, and *D. cruentata*, Butl., but distinguished by the much broader black areas on both sides of the wings.

Huphina leucophora.

Male.—Upperside. Both wings creamy white, with broad black outer marginal bands. Anterior wings with the base and costal margin dusted with grey scales; the apical third and outer marginal area broadly black, having its inner edge irregularly indented between the veins and being narrowest

at the outer angle; in the middle of the black area is a row of six white spots between the veins, the spot nearest the costa linear, the second (which is the largest of the series) and the third each bordered on the inner side by an elongate streak of white scales; the three lowest spots are smaller. The posterior wings are broadly bordered with black, in which, between the lowest subcostal and discoidal nervules, is a small patch of white scales near the inner edge of the black border.

Underside. Anterior wings as on the upperside, but the costal area is rather broadly brownish black and the base tinged with yellow; the row of white spots of the upperside is represented by the same number of spots, but they are more uniform in size, and the three upper spots are yellow. Posterior wings bright lemon-yellow, with a brownish-black outer marginal band, broader than on the upperside, in the middle of which is a series of indistinct yellow streaks or spots; the inner edge of the black band is very irregularly defined.

Female.—Upperside. Both wings purer white than in the male, with the dark marginal areas broader and browner. Anterior wings with the costa and basal third densely irrorated with grey scales, and three subapical white spots, of which the middle spot is the largest and the uppermost nearly obsolete. Posterior wings with the white area more or less densely irrorated with grey scales, and a small cluster of white scales above the discoidal nervule in the dark area.

Underside. Anterior wings with the series of yellow spots before the apex larger, and the three lowest spots nearly obsolete. Posterior wings pale yellow, with the veins crossing the pale area white, and two yellow spots situate before the apex in the dark area.

Expanse of wings $2\frac{1}{2}$ inches.

Hab. Kiriwini Island, Trobriands (*Meek*).

In the collections of Mr. Grose Smith and others.

Nearest to *H. scyllara*, Macleay, *H. lanassa*, Boisd., and *H. pallida*, Grose Smith.

Hypolimnias pallas.

Male.—Upperside. Both wings brown. Anterior wings crossed obliquely halfway between the end of the cell and the apex by an obscure ferruginous band, commencing on the costa and becoming obsolete between the two upper median nervules some distance before reaching the outer margin; a subapical oval white spot, bordered inwardly by an elongate

ferruginous streak extending nearly to the oblique ferruginous band. Posterior wings with a broad fulvous submarginal band across the disk, in which between the veins is a row of black spots, some of which are centred by a minute white spot.

Underside paler brown. Anterior wings with three spots edged with black in the cell at its upperside, and an irregular brownish-white streak a little beyond the end of the cell, followed by an irregular triangular broad band of brownish white, placed obliquely, the base of the triangle resting on the costa and the apex, which is elongated outwardly, terminating on the upper median nervule; a pale brownish-white patch a little before the apex; a row of seven black spots centred with white crosses the disk beyond its middle, outside which are two submarginal sinuate pale brown lines. Posterior wings closely resemble those of *H. formosa*, Her.-Schäff., but the pale band, which crosses the disk of that species in which the spots are situate, is more obscure.

Expanse of wings $3\frac{1}{4}$ inches.

Hab. New Hebrides.

In Mr. Grose Smith's collection.

Nearest to *H. formosa*, but a much larger insect, and the wings are more elongate.

XLI.—*New Eastern Lepidoptera.*
By Col. C. SWINHOE, M.A., F.L.S.

Fam. Nymphalidæ.

Neptis æenia, sp. n.

♀. Upperside bright brownish black, markings ferruginous, both of the colour and shade in *N. ananta*, Moore. Fore wing with the discoidal band narrower, its extremity pointed, indistinctly divided by the discoidal veinlet, and with a streak below its extremity as in *N. radha*, Moore; the interrupted discal band with its upper portion as in *N. ananta*, but narrower, its lower portion not macular, but in one almost uninterrupted narrow band: hind wings with both bands much narrower, the medial band recurved and angulated outwardly below the costa, followed by a pale indistinct band; the outer band is also somewhat recurved hindwards; a pale thin band is close outside the outward band on both wings, and another similar indistinct thin submarginal band.

Underside very unlike *N. ananta*; the ground-colour of

the wings is dark ochreous brown, and the bands all more or less dark rich ochreous. Fore wings with a subcostal streak from the base; discoidal and discal bands as above and double submarginal thin bands, the latter more grey than ochreous: on the hind wings there are seven bands, all ochreous, basal and subbasal, the medial as above, followed by another broad though less prominently coloured band, an outer band, and two submarginal bands—all these bands being twice as broad as they are on the upperside.

Expanse of wings $2\frac{4}{5}$ inches.

Batchian.

Allied to *N. neriphus*, Hew.

Neptis quilta, sp. n.

♂ ♀. Upperside olive-black, the veins outwardly lined with brownish grey, the discoidal streak on fore wing, transverse discal and submarginal bands on both wings as in *N. amba*, Moore, but all narrower and less prominent, those of the male being more sullied white and of the female olivescient white, the outer marginal lunular line brownish grey.

Underside darker purpurescent brown than in *N. amba*, all the markings very similar, but comparatively narrower and less prominent.

Expanse of wings, ♂ $2\frac{7}{8}$, ♀ 3 inches.

Cherra Punji.

The upperside has much the appearance of *N. nashona*, Swinh., but that species is allied to *N. cartica*, Moore, and is easily distinguished by the underside of the hind wings possessing only one basal white band, whereas in *N. quilta* and in *N. amba* there is a basal as well as a subbasal white band.

Eulepis sumbaensis, sp. n.

♂ ♀. Differs from *E. athamas*, Drury, in the form of the olivescient yellow patch or spot above the outer end of the transverse band of the fore wings; in *athamas* it is obliquely quadrate, sometimes nearly round and lies between veins 5 and 6; in this form there is another spot, wedge-shaped, with its point outwards, in the interspace above, divided from the lower spot by vein 6, and about half its size: on the hind wings the submarginal white spots are much larger than in *athamas*, and in place of the ochreous-red lunules that are faintly distinguishable in some examples of that species close to the outer margin is a band of orange-pink divided by the

veins, and this colour runs down the centre of both tails, replacing the blue streaks in *athamas*; on the margin between the first tail and the anal angle the band is nearly pure white. The underside is much as in *athamas*, except for the double spot on the fore wings.

Expanse of wings, ♂ $2\frac{6}{10}$, ♀ $3-3\frac{1}{10}$ inches.

Waingapo.

No doubt a local form of *E. athamas*, Drury. I have received a good number of specimens, two of them being females, from the same locality, and they do not differ in any of these characters from each other.

Fam. *Lycenidae*.

Rapala ranta, sp. n.

♂. Above as in *Rapala reactivitta*, Moore, = *R. buzaria*, de Nicév. The blue sheen on the fore wings runs below the median vein nearly to the margin, and on the hind wings from vein 2 to vein 6, but is not of so deep purple in colour as in *reactivitta*; the tail, anal lobe, and cilia are similar, the anal lobe having a slight orange mark above the black spot almost hidden by the grey hairs above it. On the underside the coloration is paler than in *reactivitta*, with an ochreous tint; the discal lines are thin, well curved (outwardly), and are outwardly edged with white, and the double lines at the anal angle above the lobe are more widely separated and are black with prominent white edgings; the tail-spot is small and the anal lobe spot large, pure black. The wings are broader, with the outer margins more rounded than in *reactivitta*, and the glandular patch of scales on the hind wing above is ochreous grey and very prominent.

Expanse of wings $1\frac{1}{2}$ inch.

Jaintia Hills. Several examples.

Might be a varietal form of *R. nissa*, without the red patch above, many male examples of *nissa* having no indication of this patch; but the sheen on the wings above is rich purple-blue, not steel-blue, as is invariably the case in *nissa*, and the thin outwardly curved transverse bands below are not representative of any example of *nissa* that I have ever seen, and I have one hundred and twenty-three with and without the red patch in my collection.

Rapala buzaria, de Nicév., is undoubtedly the same as *R. reactivitta*, Moore. I have Moore's type of the latter now before me, also many examples from the Khasia Hills and one from Bhutan. The sheen above is identical, the transverse bands below are identically the same, but are not always of

the same thickness; even the orange-line on the inner side of the anal lobe below is visible in Moore's type, in the Bhutan examples, and in some from the Khasia Hills, though not in all. Mr. de Nicéville misidentified *rectivitta* (Butt. of India, iii. p. 464), the type of which he had not seen, and compared it with his *Rapala tara* and *R. nissa*, Kollar, neither of which does it resemble.

Rapala testa, sp. n.

♂. Wings above of a dull red colour, much the same as in *Rapala petosiris*, Hew. Fore wings with broad black marginal band, as broad on the costa as it is in *R. xenophon*, Fabr., varying in the outer margin in the two male specimens before me, one being broader than the other; narrow and diffuse on the hinder margin: hind wings with the outer margin with a thin black line; costal and abdominal marginal spaces suffused with brown; anal lobe black, centred with pale pink; tails black, tipped with white; cilia red, but from the tail to the lobe and around it the cilia are white, tipped with black.

Underside dull ochreous, the transverse lines as in *R. xenophon*; the tail-spot black, without the inner orange mark, anal lobe black, some white scales on a slate-coloured patch between them; marginal line black, white on inner side; cilia as above.

♀. Brown above; anal lobe pale yellowish, with a black inner spot and ringed with black; tails black, with white tips; cilia as in the male. Underside as in the male, colour brighter yellow; cilia on both wings brown.

Expanse of wings $1\frac{1}{10}$ inch.

Jaintia Hills.

Nearest to *Rapala laima*, H. H. Druce, from Borneo.

Fam. Lasiocampidae.

Odonestis fossa, sp. n.

♂ ♀. Upperside of a uniform rufous-brown colour, the female rather paler than the male. Fore wings with very faint indications of an outwardly curved antemedial line near the base of the wings; a small white spot at the end of the cell; a brown straight line from the hinder margin before the centre to the apex of the wing; a very indistinct waved line with brown points between this and the margin: hind wings with indications of a straight medial grey band. Underside coloured as on upperside; both wings with a straight, rather broad, and diffuse transverse brown band.

Expanse of wings, ♂ 2, ♀ $2\frac{1}{10}$ inches.

Jaintia Hills.

XLII.—On *Spirorbis*: *Asymmetry of these Annelids and Phylogenic Connexion of Species in the Genus*. By MM. MAURICE CAULLERY and FÉLIX MESNIL*.

WE have recently had occasion to examine a great number of *Spirorbis* from different parts of the globe (Channel, Arctic seas, Mediterranean, Cape Horn, Panama), some twenty species, of which many are new. From a study of these, both from the anatomical and phylogenic point of view, we have arrived at the conclusions which follow.

The genus *Spirorbis* belongs to the family Serpulidæ; it is easily recognizable by its calcareous tube, fixed to a support and rolled in a regular spire with contiguous whorls. The thorax of the animal comprises in general three setigerous rings, the last two having on each side only a ventral row of uncini. Then follows a long achetous region, enclosing ovules, followed by the abdomen, which is made up of eight to forty segments, of which some contain spermatozooids. The prostomium of the animal carries a crown of feathery branchiæ; one of the branchial rays is modified, deprived of pinnules, and terminated by a calcareous piece—the *operculum*—which closes the tube when the animal withdraws itself into it.

We have drawn attention for the first time to the adaptations and modifications in the anatomy of *Spirorbis* induced by its habitat in the interior of a spiral tube. *These Annelids have become entirely asymmetrical*, of which the facts which follow are the proof:—

1. The direction of the turn of the spire is constant for a given species. We have called this *left-handed* in species in which this turning, considered in relation to the free face of the tube, has the same direction as the hands of a watch; *right-handed* when the turn is in the reverse direction. Now in the right-handed species the operculum is always borne by the second branchial ray on the right, starting from the medial dorsal line; in left-handed species it is borne by the second on the left. It is also always found on the concave side of the animal.

2. The longitudinal muscular fibres are much more developed on the same concave side.

3. The viscera (digestive tube, ovary) are thrown towards the concave side.

4. The uncini on the thorax and abdomen are larger and more numerous on the concave side.

5. The abdomen presents, as a rule, n rows of uncini on

* From the 'Comptes Rendus,' tom. cxxiv. pp. 48-50.

the convex side and $n+p$ rows on the concave side, where $p=2-4$.

6. We find a series of species, both right- and left-handed, in which the thorax presents, *on the concave side only*, a third row of uncini, representing a *fourth thoracic setigerous ring*, otherwise absent. In *Sp. cancellatus*, Fabr., this ring carries besides on the concave side dorsal bristles.

This group of arrangements shows in the clearest manner possible the influence of the spiral twist in the tube. All can be explained by the movements made by the animal. It is by thrusting itself by means of the uncini of the concave side against the calcareous wall of the tube that it emerges from it or retires. The greater activity of the organ of locomotion on this side has brought about their greater development, and the viscera have been thrown to the opposite side. This is especially obvious in the ovary; the ovules in course of maturation are always on the convex side.

We recognize that a natural (phylogenic) classification of *Spirorbis* should have for its basis the direction of the twist in the tube and that in each of the two series, right- and left-handed, must be grouped the species provided with a fourth setigerous thoracic ring on the one hand, and, on the other, those in which this does not exist. From this results the division of *Spirorbis* into four subgenera:—

Right-handed	3 setigerous thoracic rings	.....	<i>Dexiospira</i> .
species	4 " "	.....	<i>Paradexiospira</i> .
Left-handed	3 " "	.....	<i>Laospira</i> .
species	4 " "	.....	<i>Paralaospira</i> .

Lastly, we have been able to further define the phylogeny of the group by the consideration of certain anatomical characters, such as the form of the bristles of the first and third setigerous-thoracic rings, the modifications of the operculum, especially in the cases in which it functions as an incubating organ.

On all these matters, and also for the new species we have created, we would refer to our detailed memoir on these animals.

*Note by M. EDMOND PERRIER on the above Communication.**

The observations of MM. Caullery and Mesnil have considerable interest from the point of view of the precise

* 'Comptes Rendus,' t. cxxiv. pp. 50-51.

determination of the relation between Mollusca and Vermes. The early notions on this subject extend far back; it has been set forth in various ways more or less explicit since 1844 by Quatrefages, P. J. van Beneden, Carl Vogt, de Lacaze-Duthiers, Mörch, Gegenbaur, von Ihering, Giard, Hatchesek &c.

In 1881 ('*Les Colonies animales*,' p. 631 *et seq.*) I endeavoured to approach more closely than my predecessors the question which I had already treated in my course at the Muséum in 1877, and to define the resemblances of the Gasteropods, considered as the basis of the Mollusca, to the tubicolar Annelids. I remarked in particular ('*Les Colonies animales*,' p. 640) that the cephalobranchiate Annelids present, like the Gasteropods, "numerous traces of asymmetry; the *Spirographa* have one of the cephalic branchiæ almost entirely atrophied. Normally in the *Serpulidæ* there should be two opercular appendices, usually but one is developed. The twist of the spiral, so frequent in Gasteropod Molluscs, is found among the Annelids in *Spirorbis*." This twisting is complicated, according to the interesting researches of MM. Caullery and Mesnil, by an asymmetry external and internal of the most marked kind, and which is equally characteristic of Gasteropods. The resemblances of Mollusks to cephalobranchiate Annelids is thus strongly accentuated; they are, in truth, in part the resemblances of convergence. Is it now permissible to attribute the asymmetry of *Spirorbis* entirely to adaptive modifications in their anatomy induced by their habitat in the interior of a spiral tube? There are certain distinctions to be drawn. We have seen already that there are very clear indications of asymmetry in the *Serpulidæ* whose tubes are not spiral; on the other hand, it is the *Spirorbis* which has constructed its tube, and this tube cannot roll itself into a spiral by reason of an asymmetry already existing, partly at least, in the animal which has produced it. This initial asymmetry is no doubt due to an active cause like that which shows itself in Mollusks (Perrier, '*Traité de Zoologie*,' p. 2071); once the tube is formed, it can accentuate itself by reason of the special conditions of existence it imposes on the animal. But it is essential to remark that these things do not occur here as in the *Paguridæ*, which have adapted for their habitation helicoidal tubes already made.

XLIII.—On *Lepidoptera Heterocera* from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c.

[Continued from p. 349.]

Boarmia venustaria. (Pl. VII. fig. 2.)

Boarmia venustaria, Leech, Entom., Suppl. p. 44 (May 1891).

Five specimens, including both sexes, from Oiwake in Pryer's collection.

Hab. Japan.

Boarmia leucophæa.

Boarmia leucophæa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 395 (1878);
Ill. Typ. Lep. Het. iii. p. 33, pl. xlviii. fig. 12 (1879).

Boarmia elegans, Oberth. Etud. d'Entom. x. p. 31, pl. i. fig. 4 (1884).

A very fine series from Yokohama and Oiwake in Pryer's collection, exhibiting considerable variation. My specimens of the male agree exactly with Butler's type of *B. leucophæa* and also with Oberthür's figure of *elegans*; therefore I do not hesitate to consider the latter synonymous with the former.

The female is somewhat smaller than the male and the ground-colour is grey.

Var. *nigrofasciaria*, nov.

Central shade of all the wings black and conspicuous; there is an oblique streak from this to outer margin, and all the transverse lines are very distinct.

Distribution. Japan; Askold.

Boarmia angulifera.

Boarmia angulifera, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 396 (1878);
Ill. Typ. Lep. Het. iii. p. 33, pl. xlix. fig. 1 (1879).

Aleis angulifera, ab. *albifera*, Warren, Novit. Zool. i. p. 484 (1894).

There were several specimens from Oiwake and Nikko in Pryer's collection. I obtained the species at Shikotan in August and at Nikko in September; my native collector captured a few examples at Gensan and in the island of Kiushiu in July; Butler's type was from Yokohama; and I received one female specimen from Omei-shan, taken in July.

In some specimens the space between the central lines on primaries is hardly paler than the rest of the wing, in other examples it is almost white.

Distribution. Japan; Corea; Kiushiu; Kurile Islands; Western China.

Boarmia obliquaria.

Hibernia obliquaria, Motsch. Etud. 1860, p. 37.

There was a nice series from Gifu in Pryer's collection and there are specimens from Tokio and Yokohama in the National Museum at South Kensington.

Hab. Japan.

Boarmia mæsta.

Boarmia mæsta, Butl. Trans. Ent. Soc. 1881, p. 407.

Stenotracholys cinerea, Butl. op. cit. p. 409.

There were four specimens in Pryer's collection; three of these are from Oiwake and were placed with *B. conferenda*. The fourth specimen is Pryer's no. 328, which he states was from Fujisan, taken at an elevation of 12,365 feet.

Butler's type of *mæsta* was from Yokohama and his *cinerea* from Tokio.

Hab. Japan.

Boarmia crassestrigata.

Boarmia crassestrigata, Christoph. Bull. Mosc. iv. (2) p. 72 (1881).

Synopsis crassestrigata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 109.

A few specimens from Yesso in Pryer's collection. I captured some examples at Gensan in June and at Tsuruga in July.

Distribution. Amur; Japan, Yesso; Corea.

Boarmia Büttneri.

Boarmia Büttneri, Hedem. Horæ Soc. Ent. Ross. xvi. p. 54, pl. x. fig. 8 (1881).

I took a nice series at Gensan in June, including one example of the female, which differs from the male in having rather broader wings.

All my specimens are deeper in colour than Hedemann's figure.

Distribution. Amur; Corea.

Boarmia appositaria.

Boarmia appositaria, Leech, Entom., Suppl. p. 46 (May 1891).

A male specimen of this species, which is closely allied to *B. Büttneri*, Hedem., was taken by my native collector at Gensan in July. I have also received two male specimens from Chang-yang and one from Moupin.

Distribution. Corea; Central and Western China.

Boarmia grisea.

Boarmia grisea, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 396 (1878);
Ill. Typ. Lep. Het. iii. p. 33, pl. xlix. fig. 2 (1879).

A nice series from Yokohama and Oiwake in Pryer's collection.

I obtained the species at Gensan in July, and at Ningpo I met with it in the month of April.

I have received a male specimen from Kiukiang, taken in May, and a female from Omei-shan, taken in July.

In some specimens the central fascia is very distinct, but in others it is obscured by the ground-colour.

Distribution. Japan; Corea; North-eastern, Central, and Western China.

Boarmia jejunaria, sp. n.

Brownish grey, with slight violet tinge; basal area suffused with ochreous. Primaries have a blackish discal spot surmounted by some blackish scales, and there are three transverse black lines—the first is slightly curved towards costa, the second is obtusely angled below costa and represented by dots on the neuration below the middle; the space between the lines is rather paler than the rest of the wing; submarginal line blackish and wavy, but not distinct. Secondaries have an indistinct black discal spot, a wavy blackish central line, and an indented submarginal line, also blackish; the basal area is freckled with blackish. Fringes of the ground-colour, with black dots at their base between the nervules. Under surface whitish brown; all the wings have a black discal spot, followed by an indistinct transverse line, which does not extend to inner margin on primaries.

Expanse 38 millim.

One female specimen from Ni-tou, July.

Hab. Western China.

Boarmia basifuscaria. (Pl. VII. fig. 14.)

Boarmia basifuscaria, Leech, Entom., Suppl. p. 46 (May 1891).

There was one male specimen in Pryer's collection, and I took an example of the same sex at Oiwake in October.

Hab. Japan.

Boarmia corearia.

Boarmia corearia, Leech, Entom., Suppl. p. 44 (May 1891).

I took four male specimens and one female at Gensan in

July, and I have received one male example from Changyang, also taken in July.

Allied to *B. grisea*, Butl., but differs from that species in the non-angulation of the second line.

Distribution. Corea; Central China.

Boarmia sinuosaria.

Boarmia sinuosaria, Leech, Entom., Suppl. p. 47 (May 1891).

One male specimen taken by myself at Ningpo in April.

Hab. North-east China.

Boarmia defnita.

Boarmia defnita, Butl. Trans. Ent. Soc. 1881, p. 407.

One male specimen from Oiwake in Pryer's collection.

Butler's type was taken by Fenton at Tokio.

Hab. Japan.

Boarmia fuscomarginaria.

Boarmia fuscomarginaria, Leech, Entom., Suppl. p. 45 (May 1891).

One female specimen taken by Mr. Smith at Hakone in August.

Allied to *B. corearia*, but the lines on upper surface are not angulated in the same way and the markings on under surface are different.

Hab. Japan.

Boarmia fumosaria. (Pl. VII. fig. 5.)

Boarmia fumosaria, Leech, Entom., Suppl. p. 44 (May 1891).

Ten specimens, including both sexes, from Oiwake and Yokohama in Pryer's collection.

Hab. Japan.

Boarmia ornataria. (Pl. VII. fig. 15.)

Boarmia ornataria, Leech, Entom., Suppl. p. 45 (May 1891).

Boarmia ornataria, var. *inornataria*, Leech, l. c.

One example of the type form taken by a native collector in the island of Kiushiu; there was one specimen of the variety in Pryer's collection.

Hab. Japan and Kiushiu.

Boarmia flavolinearia.

Boarmia flavolinearia, Leech, Entom., Suppl. p. 47 (May 1891).

There were two male specimens in Pryer's collection.

Hab. Japan.

Boarmia montanaria, sp. n.

Primaries brown; first line blackish, slightly curved and preceded by a fuscous transverse shade; second line blackish, angulated below costa, thence oblique to inner margin; between these lines the costal area is filled in with pale brown; submarginal line whitish, preceded by a fuscous shade, which is broadest below the angle of the second line and almost fills up the space between this line and the submarginal; discal spot black and curved, its extremities touching the blackish central shade and forming an annulated mark. Secondaries grey-brown, striated and powdered with darker brown; the central line is indicated by a series of black dots on the nervules; there is an oblique dusky submarginal streak and the anal portion of the indistinct pale submarginal line is also bordered inwardly with dusky. Fringes brown, marked with darker at extremities of the nervules and preceded by a black lunulated line. Under surface greyish, darker on apical area of primaries, and tinged with ochreous on the costal area between the transverse lines; this last and also the discal spot are rather indistinct. Antennæ bipectinated.

Expanse 38 millim.

Seven male specimens from Omei-shan, Ni-tou, and Che-tou: July.

Hab. Western China.

Boarmia roboraria.

Geometra roboraria, Schiff. Wien. Verz. p. 101: Hübn. Geom. fig. 109.

Boarmia lunifera, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 395 (1878);

Ill. Typ. Lep. Het. iii. p. 32, pl. xlviii. fig. 10 (1879).

Boarmia arguta, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 372 (1879).

Diastictis roboraria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 103.

There were specimens from Ohoyama and Yesso in Pryer's collection.

I obtained a specimen at Nagasaki in May, one at Hakodate in August, and one at Nikko in September. Mr. Smith took this species at Hakone in August.

B. lunifera, Butl., is identical with the dark form of *B. roboraria*, which Standinger has named var. *infuscata*. *B. arguta*, Butl., is also a form of *B. roboraria* in which the transverse markings are well defined and conspicuous.

Distribution. Europe; Amur; Japan; Yesso; Kiushiu.

Boarmia displicens.

Boarmia displicens, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 395 (1878);

Ill. Typ. Lep. Het. iii. p. 32, pl. xlviii. fig. 11 (1879).

There were some specimens from Ohoyama and Nikko in

Pryer's collection. Mr. Smith took one at Hakone in August, and I received a male specimen from Ichang, also taken in August.

Distribution. Japan; Central China.

Boarmia consortaria.

Geometra consortaria, Fabr. Mant. Ins. p. 187; Hübn. Geom. fig. 168.

Boarmia conferenda, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 395 (1878);

Ill. Typ. Lep. Het. iii. p. 32, pl. xlviii. fig. 8 (1879).

Diastictis consortaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 103.

A common insect in Japan and Corea. My collectors met with it in all the localities they visited in Central and Western China.

The Japanese specimens (referable to *conferenda*, Butl.) are generally darker in colour, but they all have the characteristic markings of *consortaria*.

The Chinese specimens are tinged with cinnamon-brown, and some examples are much larger than the type.

Distribution. Europe; Amur; Askold; Corea; Japan; Western and Central China.

Boarmia corticaria, sp. n.

Male.—Pale brown, powdered with dark brown. Primaries clouded with blackish before the whitish submarginal line: first transverse line wavy, second oblique throughout the middle of its course, but dentate below costa and above inner margin, both black; between these lines there is a black spot and a blackish central shade, terminating in a dark brown cloud on inner margin, and beyond the second line there is a dark shade connecting the blackish clouding before submarginal line with a smaller cloud on inner margin; from this shade there are projections along the median nervules. Secondaries have a black central spot, two transverse lines and a whitish submarginal line; the latter is shaded inwardly with blackish and the second black line is bordered outwardly with dark brown. Fringes brown, preceded by a black lunulated line. Under surface pale brown, irrorated with darker brown; there is a black spot and a broad submarginal fuscous-brown band on each wing; the latter is preceded by a brownish line, which is bifurcated towards abdominal margin and followed by some whitish patches on the outer marginal area. Antennæ bipectinated. Thorax agrees with wings in colour; collar dark brown; tip of abdomen with tuft of long silky pale brown hairs.

Female.—Rather paler than the male on both surfaces.

Expanse, ♂ 76, ♀ 80 millim.

Three specimens. One example of each sex from Chang-yang and a male from Ichang: June and July.

Hab. Central China.

- *Boarmia stolidaria*, sp. n.

Whitish brown, finely striated with reddish brown. Primaries have a dark irregular basal patch; an obscure dark brown subbasal transverse line, commencing in a darker quadrate patch; beyond there is a curved and recurved dark brown transverse line, clouded on its middle; the submarginal band is twice interrupted. Secondaries have a slightly elongate blackish discal spot, and a serrated dark transverse line, marked with black on the nervules, beyond; submarginal band as on primaries. Under surface similar to above, but the transverse lines of primaries are only faintly indicated. Fringes brownish, tipped with blackish and preceded by a black line.

Expanse, ♂ 64, ♀ 70 millim.

One male specimen from Chang-yang and a female from Ni-tou: July.

Hab. Central and Western China.

Boarmia majuscularia, sp. n.

Ochreous brown, irrorated with fuscous. Primaries have three purplish-brown transverse lines, commencing in clouds of the same colour on the costa; the first is slightly curved, the second is elbowed below costa, and the third is crenulate and undulated and is followed by a large diffuse purplish-brown cloud about the middle; submarginal line whitish, interrupted about the middle—the upper portion is inwardly bordered with purplish brown towards costa, and intersects a large patch of the same colour; the lower portion is also inwardly edged with purplish brown. Secondaries have a brown discal spot and two transverse lines of the same colour; the outer one edged externally with whitish towards abdominal margin. Fringes grey, marked with paler and preceded by an interrupted brown line. Under surface similar to above, but the ground-colour is paler and the transverse markings are only faintly indicated on primaries.

Expanse 74 millim.

One female specimen in Pryer's collection.

Hab. Japan.

Boarmia Pryeraria, sp. n.

Whity brown, tinged with ochreous and marked with

black. Primaries have a subbasal band indicated on costa and inner margin; a large discal spot and two larger spots on outer margin; central line macular and sinuous; submarginal line whitish and sinuous; the space between these lines is clouded with black. Secondaries have a discal dot; the whitish, wavy, submarginal line is broadly bordered inwardly with blackish, and there are some spots on the nervules representing a central line. Fringes of primaries black and of secondaries whity brown preceded by a lunulated line. Under surface whity brown; the outer marginal area of primaries is blackish, enclosing a patch of the ground-colour at apex and another about the middle; the discal spot is distinct; secondaries have a blackish discal spot and submarginal band, the latter encroaching on the outer margin towards apex and again towards anal angle.

Expanse 33 millim.

One female specimen in Pryer's collection.

Hab. Japan.

Boarmia sinicaria, sp. n.

Primaries whitish grey, powdered and suffused with brownish on the costa and on inner marginal area; there is a blackish spot at the base of the wing; basal third suffused with brownish and limited by a double, blackish, nearly straight line; the outer third purplish brown, with an angular projection from the middle to the annular blackish discal spot, and limited by a black angulated line; submarginal line black, marked with whitish on the costa and bordered with violet-grey below; there is a blackish mark on the costa above the discal spot and another beyond it. Secondaries pale whity brown; the outer marginal area is dark grey, and there is a short oblique dash of the same colour above anal angle; discal spot dark grey. Fringes of primaries purplish brown, spotted with yellowish, the central spots are confluent; of secondaries whity brown, slightly darker at the extremity of the nervules; the fringe on all the wings preceded by a series of black lunules. Under surface pale whity brown, costa of primaries yellowish; all the wings broadly bordered with fuscous, and this colour projects on the primaries to the annulated discal spot; the basal two thirds of secondaries are powdered with fuscous, discal spot blackish.

Expanse 36 millim.

One female specimen from Omei-shan, July.

Hab. Western China.

Allied to *B. semiclarata*, Walk.

Boarmia subochrearia, sp. n.

Primaries brownish grey, suffused with fuliginous on outer marginal area; there are three black transverse bands—the first is curved, the second is elbowed below costa and again above the inner margin, the third (submarginal) is sinuous; on the middle of the outer marginal area there is a more or less quadrate pale spot, and the inner margin is tinged with reddish brown; discal dot black. Secondaries ochreous brown, suffused with dark grey towards the base and along the abdominal area; discal dot black. Fringes ochreous brown, marked with dark grey at extremities of the nervules, and preceded by a series of black lunules. Under surface: primaries ochreous grey, with a blackish discal dot and some fuscous clouds beyond it and below apex; of the transverse bands of upper surface only the first is clearly reproduced; secondaries ochreous brown, sprinkled with dark grey; discal dot black.

Expanse 36 millim.

One female specimen from Omei-shan.

Hab. Western China.

Nearly allied to *B. semiclarata*, Walk.

Boarmia bilinearia, sp. n.

Primaries olive-brown, closely striated and mottled with dark brown, traversed by two blackish lines—the first is elbowed below costa, and then curved and recurved to inner margin; the second is strongly serrated; there is a short blackish oblique apical streak. Secondaries greyish brown, mottled with dark brown; discal spot black; transverse line blackish, attenuated from abdominal margin to just beyond middle, where it becomes obscured. Fringes agree with the wings. Under surface pale greyish brown, irrorated with darker; discal spots blackish, and indications of a dusky band beyond the middle of each wing.

Expanse 32 millim.

One male specimen from Moupin, July.

Hab. Western China.

Boarmia punctimarginaria, sp. n.

Fuliginous. Primaries have a pale brown patch at the base limited by a black line; central shade blackish, with the black discal dot on it; beyond there is a black dentate line followed by a blackish shade; on the outer margin there is a series of whitish dots, each dot preceded by a blackish one.

Secondaries similar, but the basal patch is of less extent. Under surface grey-brown; all the wings have a conspicuous black discal spot, and the markings of upper surface are indicated.

Expanse 28 millim.

One male specimen from Kiukiang, June.

Hab. Central China.

— *Boarmia* (?) *nigrofasciaria*, sp. n.

Primaries whitish brown; central fascia blackish, tapering towards inner margin, and enclosing a black curved discal spot, the edges dentate; there is a blackish cloud on the costa just beyond the fascia, one on outer margin above the middle, and one towards outer angle; submarginal line pale but indistinct. Secondaries whitish brown, with a blackish discal spot and dentate central line. Fringes of the ground-colour preceded by a black line. Under surface similar to above, but markings are fainter. Antennæ bipectinated, the branches rather long.

Expanse 33 millim.

One male specimen from each of the following localities:—Chow-pin-sa, Chia-ting-fu, Pu-tsu-fong: June and July.

Hab. Western China.

Boarmia divisaria, sp. n.

Basal two thirds of primaries brownish, traversed by a blackish line, which is curved towards costa and limited by a dentate black line; outer marginal area brownish, inwardly limited by a waved serrated black line; the area between this line and the basal two thirds is whitish; submarginal line wavy, whitish, preceded by black marks; discal spot black, elongate. Secondaries pale grey, irrorated with fuscous, especially on basal and outer marginal areas; discal dot and central line dusky, the latter almost straight; submarginal line whitish, wavy. Fringes pale brownish grey, preceded by a lunulated brownish line. Under surface ochreous grey, irrorated with fuscous; all the wings have a blackish discal mark and a narrow dusky transverse band beyond, the latter marked with blackish on the neuration. Antennæ bipectinated.

Expanse 36 millim.

One male specimen from Pu-tsu-fong, taken in June or July.

Hab. Western China.

— *Boarmia decoloraria*, sp. n. (Pl. VII. fig. 4.)

Male.—Whity brown, finely powdered with darker brown. Primaries have a brownish basal band (sometimes only represented by a spot on the costa and a dot on each nervure below it); a dark brown serrated central band commencing in an angular mark on the costa, represented by dots on the nervules, and terminating in an oblique dash on the inner margin; submarginal band dark brown, irregular in width and externally edged with whitish, as also is the central band; there is also a brownish spot on costa between basal and central bands, from which a dark shade is sometimes projected to the wide portion of central band. Secondaries have three brownish transverse bands, the first nearly straight, the second narrow and attenuated, and the third of irregular width, the last two edged externally with whitish. All the wings have a blackish discal spot. Fringes brown, preceded by dark brown lunules between the nervules. Under surface of primaries fuscous brown, except the outer and inner margins, which are whity brown; of the secondaries whitish, sprinkled with brown scales; a blackish discal spot on each wing, but only the primaries have the transverse markings, and these are not always clear. Antennæ broadly bipectinated.

Female.—Generally paler than the male, and the under surface of all the wings is usually whity brown, powdered with brown scales (this is also the case in some males); the antennæ are simple.

Expanse, ♂ 40–45, ♀ 36–42 millim.

A long series taken in June and July at Chang-yang; Moupin; Ta-chien-lu; Omei-shan; Wa-shan; Pu-tsu-fong; Chia-ting-fu; Ni-tou.

Hab. Central and Western China.

Near *B. nooraria*, Brem., from Amurland.

Boarmia abietaria.

Geometra abietaria, Hübn. Geom. fig. 160.

Deileptenia ubietaria, Hübn. Verz. Schmett. p. 316; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 105.

Boarmia abietaria, Treit. Schmett. vi. 1, p. 204; Dup. Lép. vii. pl. clx. figs. 2, 3; Guen. Phal. i. p. 243.

There were a few specimens from Oiwake in Pryer's collection, and I have received one example of each sex from Mr. Manley, who took them at Yokohama.

The Japanese specimens are rather larger and more strongly marked than European examples.

Distribution. Europe; Japan.

Boarmia approximaria, sp. n.

Allied to *B. abietaria*, Hübn. Greyish, heavily powdered and clouded with brown; the first line of primaries is straighter, the second more deeply elbowed below the costa and more oblique thence to inner margin, where it terminates closer to the first line. The under surface is fuscous and not ochreous as in *B. abietaria*, and the only markings are a discal spot on primaries and indications of a central transverse line on each of the wings.

Expanse, ♂ 48, ♀ 52 millim.

One example of each sex from Ni-tou and a male from Pu-tsu-fong, July.

Hab. Western China.

Boarmia dolosaria, sp. n.

Fuliginous grey. Primaries traversed by two black lines—the first, commencing in a spot on the costa, is sharply angled below costa and again above inner margin; the second is serrated, curved below costa, thence oblique to inner margin. Secondaries have a dusky band with the blackish discal spot on it and a rather sinuous black line beyond; submarginal band dusky, edged outwardly with greyish. Fringes agree with the wings in colour and are preceded by a lunulate black line. Under surface silky fuscous grey; all the wings have a black discal spot, a transverse line, and a broad dusky submarginal band. Antennæ bipectinated.

Expanse 42 millim.

One male specimen from Chang-yang.

Hab. Central China.

Allied to *B. admissaria*, Guen.

Boarmia incongruaria, sp. n.

Male.—Primaries brown; first transverse line darker and only distinct on costal area; second line also darker, slightly elbowed below costa, thence oblique to inner margin; between the lines is a black discal dot and a curved brownish central shade; submarginal line whitish, dentate, preceded by a blackish band. Secondaries rather paler than the primaries; submarginal line pale, bordered inwardly with blackish, but not so strongly as on primaries. Fringes concolorous with the wings. Underside whitish brown slightly tinged with fuscous: primaries have a blackish submarginal band; secondaries a blackish central dot and a whitish transverse line, both indistinct. Antennæ bipectinated.

Female.—Similar to the male, but the secondaries have a blackish central line outwardly edged with whitish, and between this and the base of the wing there is a brownish transverse shade.

Expanse, ♂ 38, ♀ 40 millim.

One example of each sex. The male from Omei-shan and the female from Ni-tou, July.

Hab. Western China.

— *Boarmia punctilinearia*, sp. n.

Pale greyish brown, suffused with darker and striated with blackish. Primaries have a black discal spot and two black transverse lines—the first wavy, preceded by a blackish cloud, and the second serrated, with black dots upon it, and followed on the costa by a clear space of the ground-colour; submarginal band blackish, interrupted. Secondaries have a black discal dot and a serrated black transverse line with black dots upon it; submarginal line as on primaries, but less distinct. Fringes agree with the wings and are preceded by an interrupted black line. Under surface grey, powdered with fuliginous and bordered on outer margins with the same colour; all the wings have a black discal spot and there are indications of one transverse line. Antennæ bipectinated.

Expanse 32 millim.

One male specimen from Huang-mu-chang, July.

Hab. Western China.

— *Boarmia olivacearia*, sp. n.

Dark greyish brown tinged with olivaceous. Primaries have two transverse blackish lines—the first appears to be curved, but is only to be traced from costa to median nervure; second line waved and angled below costa; submarginal line whitish, preceded on the apical area of the wing by a reddish-brown cloud; there is a small black discal spot and a dusky shade beyond extending from the costa to the middle of the wing, the continuation of this shade is represented by a quadrate dusky spot on the middle of the inner margin. Secondaries have a black discal spot and blackish wavy central line; submarginal line as on primaries, the area between the lines is faintly clouded with reddish brown. Fringes grey, marked with brown at the extremities of the nervules, and preceded by a dark dotted line. Under surface brownish grey; all the wings have a blackish waved line, indicated by short dashes on the nervules, a dusky

transverse shade between this line and the base of the wing, and a broadish pale band before outer margin. Antennæ bipectinated.

Expanse 40 millim.

One male specimen from Wa-shan, June.

Hab. Western China.

Boarmia projectaria, sp. n.

Primaries blackish grey irrorated with whitish; basal line blackish, indented below costa, and edged internally with whitish; beyond the middle there is a rather broad whitish band forming a double angle about the middle, and outlining in its course a conspicuous quadrangular projection of the ground-colour; submarginal line pale but indistinct, with a small blackish cloud on it towards costa; discal spot black. Secondaries whitish, irrorated with blackish grey; discal spot black; central line black, crenulate, with a double-toothed projection about the middle, increasing in width towards abdominal margin. Fringes yellowish, marked with dark grey, and preceded by a series of black spots on the primaries, and by an interrupted black line on secondaries. Under surface similar to above, but the first line is absent.

Expanse, ♂ 28-30, ♀ 33 millim.

Nine specimens, including both sexes, from the following localities, Pu-tsu-fong, Ni-tou, Che-tou, and the Province of Kwei-chow: July.

Hab. Western China.

In some specimens the white band of primaries is suffused with blackish grey, and the secondaries are thickly powdered with the same colour. Antennæ bipectinated in the male.

Boarmia mirandaria, sp. n.

Primaries grey-brown, basal patch pale reddish limited by a curved dark line; a pale reddish patch occupies a large portion of the outer two-thirds of the wing, but does not extend to the costa, and is separated from outer margin by an undulated whitish line, this patch is traversed by a dark wavy line edged with whitish and angled below costa. Secondaries pale reddish, with a patch of grey-brown on the base and on lower portion of the outer marginal area; submarginal line pale; discal spot black. Fringes whitish, preceded by a dark line. Under surface pale brown slightly suffused with fuscous; all the wings have a serrated blackish transverse line beyond the middle, and a dusky shade between

it and the base of the wing; secondaries have a blackish discal dot. Antennæ bipectinated.

Expanse 36 millim.

One male specimen from Ichang, June.

Hab. Central China.

Boarmia insolitaria, sp. n.

Primaries have the costal area drab, freckled and clouded with darker brown, and the inner portion of the wing brown, tinged with ferruginous, and clouded with drab on outer margin; there are indications of two dusky transverse lines and a pale submarginal line. Secondaries are drab at the extreme base on outer marginal third, the intervening space being fuscous brown; there is a brownish cloud tinged with ferruginous above anal angle. All the wings have a blackish discal spot, that on primaries only is distinct. Under surface pale brown, clouded and suffused with fuscous; there is a straight dusky central line on which is the discal spot, and beyond there is a slightly curved but indistinct dusky line; the latter is followed by a ferruginous-brown band; the secondaries are similarly marked.

Expanse 42 millim.

One female specimen from Chang-yang, July.

Hab. Central China.

Boarmia moupinaria, sp. n.

Pale grey powdered with darker. Basal half of primaries darker; first line curved, second line almost straight, interrupted in the middle, and bordered with ochreous grey, both are blackish and between them there is a dusky fascia; submarginal line pale grey inwardly edged with blackish. Basal third of secondaries darker; central line blackish, almost straight, and edged with ochreous grey; submarginal line pale grey inwardly edged with darker. Fringes of the ground-colour, preceded by a black line on secondaries and a series of dots on primaries. Under surface whitish grey; costa and outer marginal area of primaries tinged with fuscous; all the wings have a black discal spot.

Expanse 44 millim.

One female specimen from Moupin, June.

Hab. Western China.

Boarmia flavimacularia, sp. n.

Purplish brown. Primaries traversed by two brownish and one silvery-grey line, the latter bordered on each side

with reddish brown, and preceded on costal area by a brown and grey suffusion; the base is powdered with silvery grey, and there is a large pale buff apical patch transversely clouded with brownish, and having two black dots on its outer edge. Secondaries have a dusky subbasal line and discal spot, and beyond these are two wavy lines, which become indistinct towards costa: the first of these is inwardly bordered with brownish and has a pale yellow dot on its edge above the middle. Under surface fuscous: primaries have the apical patch as above, and the secondaries are sparingly freckled with pale buff.

Expanse 34 millim.

Five specimens from Pu-tsu-fong, Chia-ting-fu, Chang-yang: July and August.

Hab. Central and Western China.

Genus JANKOWSKIA.

(Oberth. Etud. d'Entom. ix. p. 25 (1884).)

Jankowskia athleta.

Jankowskia athleta, Oberth. Etud. d'Entom. ix. p. 25, pl. ii. fig. 7 (1884).

Recorded by Oberthür from Sidemi, Manchuria.

Jankowskia thoraciaria.

Jankowskia thoraciaria, Oberth. Etud. d'Entom. ix. p. 20, pl. ii. fig. 8 (1884).

Recorded by Oberthür from Sidemi, Manchuria.

—*Jankowskia fuscaria.*

Boarmia fuscaria, Leech, Entom., Suppl. p. 45 (May 1891).

One male and two female specimens from Oiwake in Pryer's collection.

I received the species from Chang-yang, Ichang, Moupin, Omei-shan: June and July.

Allied to *J. athleta*, Oberth., but can at once be distinguished by the yellow marking on the under surface of the costa of primaries.

Distribution. Japan; Central and Western China.

Genus SYNOPSISIA.

(Hübner. Verz. Schmett. p. 316.)

Synopsisia paupera.

Boarmia paupera, Butl. Trans. Ent. Soc. 1881, p. 408.

Several specimens from Oiwake, Fujisan, and Yokohama in Pryer's collection.

I took the species at Sendai in September, and at Yokohama in October.

Hab. Japan.

Synopsia austeraria, sp. n.

Pale brown, powdered and clouded with darker. Primaries have a black discal dot and two transverse lines—the first is wavy and angulated below costa, the second is slightly serrated, oblique, and preceded by a transverse dusky shade; marginal area clouded with ashy. Secondaries have a blackish discal dot and a blackish serrated transverse line, preceded by a dusky transverse shade; outer marginal area clouded with ashy. Fringes preceded by a dark line. Under surface greyish brown, powdered with darker, and with blackish discal spots and faint indications of transverse lines.

Expanse 49 millim.

One female specimen from Pu-tsu-fong, June.

Hab. Western China.

Genus *HEMEROPHILA*.

(Steph. Ill. Brit. Haust. iii. p. 180 (1820).)

— *Hemerophila Dejeani*.

Hemerophila Dejeani, Oberth. Etud. d'Entom. x. p. 30, pl. i. fig. 12 (1884); Alph. Rom. sur Lép. vi. p. 60 (1892).

This appears to be a common species in June and July at Ta-chien-lu, Omei-shan, and Pu-tsu-fong. I also received specimens from Ni-tou, Che-tou, and Wa-shan; and Alphéraky records the species from Ou-pin.

It is exceedingly variable in coloration, which ranges from reddish brown to dark olive-brown, and the central area is often very pale.

Hab. Western China.

— *Hemerophila senilis*.

Hemerophila senilis, Butl. Ill. Typ. Lep. Het. ii. p. 48, pl. xxxv. fig. 12 (1878).

Several specimens from Oiwake, Nikko, and Gifu in Pryer's collection.

My native collector captured the species at Hakodate in June or July.

Hampson (Fauna Brit. Ind., Moths, iii. p. 275) considers *H. senilis* to be synonymous with *H. subplagiata*, Walk.

Hab. Japan and Yesso.

—*Hemerophila conjunctaria*, sp. n. (Pl. VII. fig. 9.)

Female.—Allied to *H. senilis*, Butl., but the basal fascia, which, together with the outer marginal area of primaries, is purple-brown in colour, ornamented with lilacine at apex and on inner margin, is broader and more deeply indented below the costa; the central transverse line of secondaries is sinuous, not curved below costa, and there are some lilacine dashes on outer margin; discal spot on all the wings distinct. Under surface whitish, freckled with brownish and a little suffused with dusky on the outer margin of primaries; there is a black discal spot and a dotted line, also black, on each wing. The posterior portion of the thorax is edged with white.

Expanse 46 millim.

Two female specimens from Pu-tsu-fong, July.

Hab. Western China.

—*Hemerophila atrilineata*.

Hemerophila atrilineata, Butl. Trans. Ent. Soc. 1881, p. 405.

Phthonandria atrilineata, Warren, Novit. Zool. i. p. 434 (1894).

There were some examples from Oiwake and Nikko in Pryer's collection, and I captured specimens at Tsuruga in July. My native collector took the species at Hakodate and Gensan, also in July, and I have received one male specimen from Ta-chien-lu, taken in June.

Distribution. Japan; Yesso; Corea; Western China.

Hemerophila rimosa.

Boarmia rimosa, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 372 (1870).

A few nice specimens from Yokohama in Pryer's collection; my native collector took the species in the island of Kiushiu.

Hab. Japan and Kiushiu.

—*Hemerophila obscuraria*, sp. n.

Reddish brown, much powdered with darker. Primaries have two oblique black lines—the first curves a little as it approaches the inner margin, and the second is wavy throughout and curved towards costa, both are preceded by a blackish shade; there is a dark cloud below the apex and another below it extending to inner margin near the angle, this latter is interrupted. Secondaries have a black line, broad on abdominal margin and tapering towards costa, this is preceded by a dusky transverse shade and followed by two

paler bands. At the base of the fringes, which are concolorous with the wings, there is a blackish wavy line. Under surface rather silky brown: primaries have two transverse black lines, chiefly indicated by dots on the neuriation, which converge towards the inner margin; secondaries have two equidistant, curved, and wavy black lines.

Expanse 50 millim.

Two specimens from Pu-tsu-fong, June.

Hab. Western China.

Hemerophila latimarginaria, sp. n.

Pale cinnamon-brown, with a black discal spot on all the wings. Primaries have an irregular dark brown line beyond the middle limiting the outer marginal area, which is darker brown and is traversed by a dusky submarginal band; the basal area is slightly irrorated with darker brown. Secondaries have a curved and slightly wavy dark brown central line, the area beyond is darker brown traversed by a dusky submarginal band. Under surface whitish brown, suffused with darker on primaries, and these wings have a blackish discal spot.

Expanse 40 millim.

One female specimen from Ichang, April.

Hab. Central China.

Hemerophila (?) *tachraparia*.

Hemerophila tachraparia, Oberth. Etud. d'Entom. xviii. p. 25, pl. v. fig. 63 (1893).

I have not seen this species. Oberthür describes it from specimens received by him from Ta-chien-lu, Western China.

Genus *MEDASINA*.

(Moore, Lep. Ceyl. iii. p. 408 (1886); Hampson, Fauna Brit. Ind., Moths, iii. p. 283 (1895).)

Medasina scotosiaria.

Deinotrichia scotosiaria, Warren, Proc. Zool. Soc. Lond. 1893, p. 420, pl. xxx. fig. 9.

Medasina scotosiaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 284 (1895).

Two male specimens from Pu-tsu-fong, June.

Distribution. Sikhim (*Hampson*); Western China.

Medasina diffusaria, sp. n.

Brown, irrorated with fuscous on secondaries and margins

of primaries. There are indications of two transverse lines on primaries, the outer one represented by blackish dots on the neuriation; submarginal band blackish, diffuse and interrupted. Secondaries have a blackish discal spot, two transverse lines, and a diffuse blackish submarginal band, the latter does not extend to costa. Fringes of the ground-colour, preceded by an interrupted blackish line. Under surface rather paler than above; all the wings have a blackish discal spot and an obscure dusky band beyond.

Expanse 74-84 millim.

Four male specimens from Chang-yang, taken in July.

Hab. Central China.

Allied to *M. creataria*, Moore.

- *Medasina creataria*.

Hemerophila creataria, Guen. Phal. i. p. 217 (1857).

Medasina creataria, Hampson, Fauna Brit. Ind., Moths, iii. p. 286 (1895).

Two female specimens from the Province of Kwei-chow, June.

Distribution. Sikhim; Assam (*Hampson*); Western China.

Medasina albidaria.

Boarmia albidaria, Walk. Cat. Lep. Het. xxxv. p. 1582 (1866).

Medasina albidaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 289 (1895).

I received one male specimen from Ichang, April; one example of each sex from Omei-shan; and a female from Moupin, July.

Distribution. Simla; Dharmasála; Sikhim; Khásis (*Hampson*); Central and Western China.

GENUS ARICHANNA.

(Moore, Proc. Zool. Soc. Lond. 1867, p. 668; Hampson, Fauna Brit. Ind., Moths, iii. p. 290 (1895).)

Arichanna tetrica.

Cidaria tetrica, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 451 (1878); Ill. Typ. Lep. Het. iii. p. 50, pl. lv. fig. 10 (1879).

Cidaria tetrica, Butl., ♀; Alph. Rom. sur Léop. vi. p. 78, pl. iii. fig. 11 (1892).

There was an example of each sex from Ohoyama in Pryer's collection, and my native collector took a female specimen at Hakodate in June.

Hab. Japan and Yesso.

Arichanna interruptaria, sp. n.

Primaries whitish, powdered with blackish grey; there are three transverse bands interrupted by the brown neuration and intersected by white or whitish lines; discal spot black, separated from a spot on costa by the brown subcostal nervure; from the lower end of discal spot there is a blackish diffuse line, which appears to be part of the second or central band. Secondaries whitish, powdered and freckled with greyish; discal spot blackish. Fringes pale brown, chequered with darker, preceded by a brown line on secondaries and by a row of black dots on primaries. Under surface pale brown, powdered and freckled with darker: the primaries have a smoky suffusion, a black discal spot, and indications of the transverse bands of upperside; the secondaries have a black discal spot and dark brown wavy central band. Antennæ of the male ciliated.

Expanse 42-46 millim.

Two male specimens and four females from Omei-shan: July and August.

The markings are very similar to those of *A. similaria*, but they are blackish rather than olive-brown, and the neuration is brown instead of pale olive. The structure of the antennæ is quite different.

Hab. Western China.

Arichanna ramosa.

Scotosia ramosa, Walk. Cat. Lep. Het. xxxv. p. 1088 (1866).

Arichanna ramosa, Hampson, Fauna Brit. Ind., Moths, iii. p. 291 (1895).

One female specimen from Pu-tsu-fong, July.

Distribution. Sikkim (*Hampson*); Western China.

Arichanna similaria, sp. n.

Male.—Primaries white, powdered with brownish; the base is dark olive-brown, and there are four transverse bands of the same colour interrupted by the broad pale olive neuration; the second and third of these bands unite on the inner marginal area, where they represent a quadrate patch; the fourth is intersected by an interrupted white line, as also is the third above the quadrate patch referred to. Secondaries whitish, freckled with greyish; central band and incomplete submarginal band greyish; discal spot blackish. Fringes pale olive, chequered with darker. Under surface whitish, powdered and freckled with greyish brown: primaries suffused with shining fuscous except at apex; secondaries

have a discal spot and central band as above. Antennæ brown, bipectinated.

Female.—Markings of primaries as in the male; bands of secondaries not well defined beyond abdominal area.

Expanse, ♂ 48, ♀ 50 millim.

Allied to *A. ramosa*, Walk., and *A. tetrica*, Butl.

One example of each sex from Omei-shan, July.

Hab. Western China.

— *Arichanna clavaria*, sp. n.

Male.—Greyish brown, powdered and mottled with darker. Basal area of primaries marked with black and limited by a double-indented black line; discal spot black, preceded by a whitish quadrate patch, and followed by a dusky cloud-like band; on the outer marginal area there is a series of black bars intersected by an interrupted white line; submarginal line white, macular. Secondaries have a dusky discal spot, central band, and interrupted submarginal band. Fringes pale brown marked with darker. Under surface of primaries greyish brown, suffused with blackish, discal spot black; beyond the middle of the wing there are indications of a pale transverse line: secondaries as above. Antennæ bipectinated.

Female.—Similar to the male, but the ground-colour is browner, the whitish patch before discal spot on primaries is absent, and the bands on under surface of secondaries are less distinct.

Expanse, ♂ 42, ♀ 44 millim.

One male specimen from Omei-shan, taken in August, and a female from Pu-tsu-fong, July.

Hab. Western China.

Arichanna Pryeraria.

Arichanna Pryeraria, Loech, Entom., Suppl. p. 51 (May 1891).

I received a male specimen from Mr. Manley of Yokohama, and there was a female example from Oiwake in Pryer's collection.

Allied to *A. furcifera*, Moore.

Hab. Japan.

— *Arichanna diffusaria*, sp. n.

Primaries whitish, with interrupted and irregular fuliginous-brown subbasal, central, and marginal bands, the latter intersected by an oblique streak of the ground-colour from apex; the space between subbasal and central bands is

dotted with fuliginous brown, as also is that between central and marginal bands at middle and towards costa and inner margin; costa and nervures marked with ochreous. Secondaries whitish spotted with fuscous grey, the larger of the spots representing central, submarginal, and marginal bands. Under surface similar to above, but the markings, which are pale fuscous on primaries, are fainter, and on secondaries rather stronger.

Expanse 56 millim.

One female specimen from Pu-tsu-fong, June.

Hab. Western China.

Arichanna albomacularia. (Pl. VII. fig. 10.)

Arichanna albomacularia, Leech, Entom., Suppl. p. 51 (May 1891).

Two male and five female specimens, from Gifu and Oiwake, in Pryer's collection.

Allied to *A. tetrica*, Butl., but distinguished by the large white spot on primaries.

Hab. Japan.

Arichanna consocia.

Abraxas consocia, Butl. Ann. & Mag. Nat. Hist. (5) vi. p. 226 (1880).

Icterodes consocia, Butl. Ill. Typ. Lep. Het. vi. p. 84, pl. cxix. fig. 11 (1886).

Arichanna lapsariata, Hampson, Fauna Brit. Ind., Moths, iii. p. 293 (1896).

One female specimen from Ni-tou, July.

Distribution. N.E. Himalayas (*Butler*); Western China.

Arichanna melanaria.

Phal. Geometra melanaria, Linn. Syst. Nat. x. p. 525; Clerck, Icon. pl. iv. fig. 2.

Geometra melanaria, Esp. v. p. 115, pl. xxiii. fig. 1; Hübn. Geom. fig. 26.

Diastictis melanaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 104.

Rhyparia fraterna, Butl. Ill. Typ. Lep. Het. ii. p. 53, pl. xxxvii. fig. 9 (1878).

Rhyparia askoldinaria, Oberth. Etud. d'Entom. v. p. 52, pl. ix. fig. 11 (1880).

Icterodes sordida, Butl. Ann. & Mag. Nat. Hist. (5) xi. p. 116.

Fraterna, Butl., is a pale form of *A. melanaria*, and is almost exactly identical with some European examples of the species in my collection. *Sordida*, Butl., is a dark form also agreeing with some European specimens, and *askoldinaria* is a form intermediate between the two. Alphéraky mentions a variety of the species from Pei-chouf (Rom. sur Léop. vi. p. 55).

There were specimens in Pryer's collection from Yokohama, Oiwake, and Nikko. I obtained the species at Gensan in June.

Distribution. Europe; East Siberia; Amur; Askold; Corea; Japan.

—*Arichanna confusaria*, sp. n.

Primaries white; basal area limited by an interrupted blackish band, clouded and marked with the same colour; the central fascia and submarginal line are also blackish, the former encloses spots of the ground-colour and the latter is macular; the spaces between the transverse markings are freckled with blackish. Secondaries whitish, freckled with grey before the blackish, wavy, central band, and ochreous beyond it; submarginal band blackish, broken up into spots, of which that nearest the middle is the largest. Fringes of primaries blackish, chequered with white, and of secondaries yellow, chequered with black, preceded on all the wings by a row of blackish spots. Under surface of primaries have the markings of the upperside indicated, and on the secondaries the markings are reproduced, but the outer half of the wing is only tinged with yellow.

Expanse, ♂ 40–44, ♀ 38 millim.

Two male specimens from Ta-chien-lu and one female from Pu-tsu-fong: June.

Hab. Western China.

In one male the markings on primaries are brownish, but not clearly defined, and the outer margin appears to have a brownish border intersected by a transverse wavy white line.

—*Arichanna flavovenaria*, sp. n.

Male.—Primaries whitish grey suffused with blackish; the basal area is marked with black and limited by a black band intersected by the fulvous venation; discal spot black; submarginal band paler than the ground-colour, followed by a broad black band, which is intersected by the venation and outwardly edged with whitish. Secondaries yellow; basal area fuliginous grey; there are three rows of black spots, those forming the first row being more or less confluent, but not forming an interrupted wavy band as in *A. undularia*. Under surface of primaries fuliginous grey and of secondaries as above, but paler in the ground-colour.

Female.—Similar to the male, but exhibiting more of the ground-colour on primaries above. Under surface of all the wings yellow; primaries flecked and clouded with blackish;

secondaries marked as above, but the basal area is only slightly tinged with fuliginous grey.

Expanse, ♂ 51, ♀ 54 millim.

One male specimen from Omei-shan and a female from Pu-tsu-fong: July.

Hab. Western China.

Arichanna flavomacularia, sp. n.

Primaries black; venation and costa broadly grey, the latter marked with five black spots, and the former, together with seven interrupted yellow lines, breaking up the ground-colour into macular transverse bands. Secondaries have the basal third grey from costa to anal angle and the outer two thirds yellow; the latter has a central black spot, an outer series of six large grey spots (the first and sixth of which are double), and a marginal series of seven or eight small spots of the same colour. Fringes of primaries blackish and of secondaries yellow to the anal third, where they are blackish. Under surface of primaries fuliginous grey, with black spots of upperside reproduced; secondaries as above.

Expanse, ♂ 56-60, ♀ 54 millim.

A fine series from Wa-shan and Ta-chien-lu, June and July. All but one are males.

Hab. Western China.

— *Arichanna undularia*, sp. n.

Male similar to *A. flavomacularia*, but smaller, and the interrupted yellow transverse lines on primaries are less clearly defined. On the secondaries there is a rather broad transverse black band in addition to outer and marginal series of spots; the blackish basal third does not extend beyond the limit of waved band, but encroaches further along the costa and encloses the discal spot. Fringes of all the wings blackish. Under surface: primaries fuliginous grey, with a black discal spot and a few yellowish dots beyond; secondaries marked as above, but the ground-colour is paler.

Expanse 53 millim.

Four male and two female specimens from Ta-chien-lu, Omei-shan, Pu-tsu-fong, Wa-shan: June and July.

Hab. Western China.

— *Arichanna lateraria*, sp. n.

Primaries grey, with a slight fuliginous tinge; the basal area is spotted with black; a conspicuously large black spot

with black cloud above on costa, and four pairs of spots of the same colour below, represent a broad central fascia (the lower pairs coalesce, forming bars); beyond these are three transverse series of black spots—the first is composed of double spots towards costa, the spots of second series are surrounded with whitish, the third series is on outer margin. Secondaries have the basal half grey and the outer half yellow; two large black spots beyond the central one form a longitudinal series of three between the limit of basal half of the wing and the outer margin; there is a larger black spot at the outer angle, three others below the outer one of longitudinal series, and a row of smaller spots before the outer margin. Fringes agree in colour with the wings. Under surface similar to the upper surface, but the primaries are more uniform in colour.

Expanse 60 millim.

Three males, Wa-shan, Moupin, and Pu-tsu-fong: July.

Hab. Western China.

Allied to *A. jaguararia*, Guen.

Judging from the three specimens under observation, this species would seem to be rather variable in number of black markings on secondaries, as in one example there is a fourth spot above those of marginal series, and in another specimen, which also has this fourth spot, there are, in addition, two spots above and two below the middle one of longitudinal series of three, thus forming a macular band.

—*Arichanna jaguarinaria*.

Rhypania jaguarinaria, Oberth. Etud. d'Entom. vi. p. 17, pl. ix. fig. 1 (1881).

Arichanna jaguarinaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 295 (1895).

One male specimen from Wa-shan, June.

Oberthür's type was from the province of Kwei-chow.

Hab. Western China.

This is probably only a form of *R. jaguararia*, Guen., in which the central macular band of secondaries is either obsolete or only faintly indicated; the yellow on these wings does not extend much beyond the submarginal series of spots.

—*Arichanna jaguararia*.

Rhypania jaguararia, Guen. Phal. ii. p. 198 (1857).

Several specimens from Ohoyama and Oiwake in Pryer's collection. I took the species at Tsuruga in July, and I have received it from Kiukiang and Ningpo. Guenée's type was

from N. China, and there are specimens in the National Collection at South Kensington from Yokohama, Hakone, Tokio, and Ashi-no-yo.

The specimens from Oiwake differ from the typical form in having the ground-colour of primaries and basal area of secondaries whiter, and for this form I propose the varietal name *pallidaria*.

Distribution. Japan; Central and Northern China.

Arichanna Gaschkevitchii.

Boarmia Gaschkevitchii, Motsch. Bull. Mosc. xxxix. p. 197 (1866).

Probably this species is identical with *Arichanna (Rhyparia) jaguararia*, Guen.

Arichanna flavomarginaria.

Rhyparia flavomarginaria, Brem. Lep. Ost-Sib. p. 83, pl. vii. fig. 11 (1864).

Abraxas flavomarginaria, Græser, Berl. ent. Zeit. 1888, p. 390.

Diastictis flavomarginaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 104.

Several specimens were captured by my native collector at Gensan in July. I have also received the species from Chang-yang, Moupin, and the province of Kwei-chow: June and July.

Distribution. East Siberia; Amur; Corea; Central and Western China.

The specimens in my series exhibit considerable variation in the size, number, and intensity of the black markings.

Genus EREBOMORPHA.

(Walk. Cat. Lep. Het. xxi. p. 494 (1860).)

Erebomorpha consors.

Erebomorpha consors, Butl. Ill. Typ. Lep. Het. ii. p. 52, pl. xxxvii. fig. 8 (1878).

Mesastrape consors, Warren, Novit. Zool. i. p. 432 (1894).

A few specimens from Fujisan and Nikko in Pryer's collection.

My native collector obtained the species at Hakodate in June or July, and there are specimens in the National Collection from Yokohama and Tokio. I have also received examples from Moupin and Chang-yang, July.

Distribution. Japan; Yesso; Western and Central China.

Some of the Chinese specimens appear to be intermediate between *E. consors*, Butl., and *E. fulgurita*, Walk.

-Genus *PHYLLABRAXAS*, nov.

Palpi porrect, reaching slightly beyond the frons and clothed with long hair; outer margins of wings rounded. Primaries of male with fovea. Neuration as in *Arichanna*. Antennæ of male ciliated and finely serrated. Hind tibiæ dilated, with a tuft of long hair and two pairs of moderately long spurs.

Type *P. curvaria*.

- *Phyllabrazas curvaria*, sp. n. (Pl. VII. fig. 3.)

Whitish, sparingly powdered with brownish. Primaries suffused with olive-grey and marked with fuliginous brown as follows:—a spot at the base; an angulated subbasal band united at the angle with a central fascia, the latter encloses a patch of the ground-colour at each end and its outer edge is curved and recurved; on the outer margin below apex there is a more or less quadrate spot, and on the costa before apex there is a similar one (these spots are united at their opposed angles), the lower encloses two white dots, which represent portions of a much interrupted submarginal line; on the outer marginal area above outer angle there is a third spot, and from the inner edge of this a streak descends to inner margin. Secondaries have a blackish discal spot and a submarginal band, the latter indicated by a brown spot on the costa, one about the middle, and a dash above anal angle. Fringes of primaries black, chequered with whitish towards inner margin; those of secondaries whitish marked with blackish. Under surface: primaries whitish, the apical spots are blackish and the basal area is suffused with the same colour; secondaries are whitish powdered with blackish, and have an incomplete central band in addition to the macular submarginal band as above, but both are blackish.

Expanse 42–46 millim.

Five specimens, including both sexes, from Ta-chien-lu, Moupin, and Omei-shan: July.

Hab. Western China.

In one female from Ta-chien-lu (the only specimen from that locality) the apical markings are browner.

- *Phyllabrazas similaria*, sp. n.

Primaries sordid whitish, freckled with blackish and marked with reddish brown as follows:—a small patch at the base; a straight narrow subbasal fascia, commencing as a spot on costa; an outwardly diffuse central fascia, broadest

on costa, and enclosing a patch of the ground-colour at each end; a rather quadrate patch on costa before apex and a similar one on outer margin below apex, united at opposed angles; from the inner edge of the lower patch a straight narrow fascia descends to inner angle, but is only clearly defined below the second median nervule; discal spot black. Secondaries white, freckled with pale grey; discal spot blackish; central and submarginal fasciae, the former hardly darker than the freckling, the latter represented by a blackish spot on costa, another about the middle, and a short blackish bar above anal angle. Fringes pale grey-brown, preceded on primaries by a row of black dots, becoming lunular towards inner angle, and on secondaries by a thin brownish line. Under surface: primaries fuscous grey, tinged with ochreous on costa, markings of upperside faintly reproduced; secondaries whitish, with the markings as above, but the central fascia is rather darker and the submarginal less distinctly indicated.

Expanse 40-42 millim.

Two male specimens from Pu-tsu-fong and one from Omei-shan: July.

Hab. Western China.

Allied to *P. curvaria*, but it differs in size and colour and also in the form of the fascia.

Phyllabraxas exsoletaria, sp. n.

Primaries whitish grey, speckled with black and suffused with smoky grey at the base of the wing and on outer marginal area; central fascia broad, slightly olivaceous, its inner edge black and undulated and its outer edge black and obtusely angled below costa; before the black discal spot there is a short black line from the costa, this is connected by a blackish suffusion with the external edge of fascia, thus forming a more or less quadrate patch on the outer costal portion of the fascia; the short line referred to has a dusky continuation to the inner margin, but it is not clearly defined; beyond the angle of fascia there are some black dots, and some other dots are placed towards inner margin and parallel with edge of fascia; submarginal line whitish, interrupted. Secondaries rather smoky white, with a black discal spot and indications of a central line. Fringes grey, preceded on the primaries by black dots between the nervules. Under surface smoky grey; basal area of primaries limited by a pale undulated and exteriorly diffuse band; secondaries greyish, speckled with darker; discal spot black; there is another

black spot about centre of the wing and blackish suffusion along abdominal margin.

Expanse 45 millim.

Three male specimens from Pu tsu-fong, June and July.

Var. divisaria.

The primaries are suffused with brownish; the central fascia is divided transversely into two parts, the outer being dark brown and the inner paler brown. Secondaries whitish, with discal spot and dusky central line which swells out into a spot about the middle and towards each extremity.

Expanse 43-48 millim.

Two male specimens from Omei-shan, July.

Hab. Western China.

--*Phyllabraxas conspicuaria*, sp. n.

Primaries white, with olivaceous markings; basal patch pale olive-brown; central fascia clouded with darker olive-brown, enclosing white discal spot and limited outwardly by an oblique series of black dots; the inner edge is slightly curved below costa; outer marginal area clouded and suffused with dark olive-brown, limited inwardly by a pale olive-brown band and enclosing two diffuse white spots. Secondaries white, freckled with greyish; incomplete central band, discal spot, and shade between the latter and abdominal margin darker grey. Fringes grey and whitish, preceded by an interrupted blackish line. Under surface: primaries have the basal two thirds dusky, limited by a series of darker dots and enclosing a white discal spot; outer area dusky, with a whitish spot at apex and another about the middle: secondaries are whitish, freckled with grey-brown; central band blackish, macular; discal spot, a small cloud on abdominal margin, and three spots on costa also blackish.

Expanse 39 millim.

Three male specimens from Pu-tsu-fong, June.

Hab. Western China.

Genus ABRAXAS.

(Leach; Hampson, *Fauna Brit. Ind., Moths*, iii. p. 297 (1895).)

Abraxas evanescens.

Callabraxas evanescens, Butl. *Trans. Ent. Soc.* 1881, p. 420.

A fine series from Oiwake and Yesso in Pryer's collection. My native collector took the species at Hakodate in August.

Hab. Japan and Yesso.

Abrazas placida.

Abrazas placida, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 441 (1878);

Ill. Typ. Lep. Het. iii. p. 48, pl. liii. fig. 1 (1879).

Callabrazas propinqua, Butl. Trans. Ent. Soc. 1881, p. 420.

A few specimens from Oiwake, Nikko, and Yesso in Pryer's collection. I captured several examples at Hakodate in August.

Hab. Japan and Yesso.

Placida, Butl., appears to be an aberrant form of *propinqua*, Butl., but as it was the first to receive a name, it must stand as the type of the species, and *propinqua*, which is really the normal form, must rank as a variety. This is certainly unfortunate, but is not by any means a singular case.

Abrazas Whitelyi.

Abrazas Whitelyi, Butl. Ill. Typ. Lep. Het. ii. p. 52, pl. xxxvii. fig. 4 (1878).

A nice series from Oiwake, Yesso, and Nikko in Pryer's collection.

I captured specimens at Gensan in June, and my native collector at Hakodate in June or July. I have also received two specimens from Mr. Manley, of Yokohama.

There is a good deal of variation in the size of the black markings. In some of the specimens, including all the examples from Oiwake, the large spots on costa and inner margin, representing the central band, are not intersected by the ground-colour as in the type. These specimens have also distinct macular submarginal and marginal bands on all the wings.

Distribution. Amur (*Græser*); Corea; Japan; Yesso.

Abrazas languidata.

Abrazas languidata, Walk. Cat. Lep. Het. xxiv. p. 1122 (1862).

Callabrazas languidata, Hampson, Fauna Brit. Ind., Moths, iii. p. 518 (1895).

Four specimens from Ohoyama in Pryer's collection.

I captured a specimen at Shimonoseki in July, and have received two examples from Omei-shan, also taken in July.

Distribution. Japan and Western China.

Abrazas martaria.

Abrazas martaria, Guen. Phal. ii. p. 205 (1857); Hampson, Fauna Brit. Ind., Moths, iii. p. 300 (1895).

I took a specimen at Foochow in April, and have received the species from Kiukiang, Ta-chien-lu, and Moupin: June.

This species may be distinguished from all the forms of *A. sylvata* by its larger size, more intense dark markings, and by the almost uninterrupted dark costal border.

Hampson considers *A. pusilla*, Butl., to be a small form of *A. martaria*, Guen., and the latter as possibly an extreme form of *A. sylvata*.

Distribution. Nepal; Sikhim; Bhutan; Assam (Hampson); Eastern, Western, and Central China.

Abraxas sylvata.

Phalena sylvata, Scop. Ent. Carn. p. 220 (1763).

Zerene leopardina, Koll. Hüg. Kasch. iv. p. 490.

Abraxas sylvata, Hampson, Fauna Brit. Ind., Moths, iii. p. 299 (1895).

Abraxas miranda, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 441 (1878);

Ill. Typ. Lep. Het. iii. p. 48, pl. lii. fig. 12 (1879).

Abraxas suffusa, Warren, Novit. Zool. i. p. 417 (1894).

Abraxas latifasciata, Warr. l. c. p. 419.

Abraxas fulvobasalis, Warr. l. c.

Abraxas suspecta, Warr. l. c.

Abraxas diminuta, Warr. l. c.

Abraxas degener, Warr. l. c.

This species appears to vary in Eastern Asia to even a greater extent than in Europe. I have specimens from various localities in Japan and from all the localities visited by my collectors in Central and Western China. Among these are examples agreeing more or less exactly with the forms named above, together with others that are intermediate between such forms and the more typical specimens. The largest individual in the series measures 60 millim. in expanse and the smallest 31 millim.

Distribution. Europe; Amur; Japan; Corea; Central and Western China.

Abraxas concinna.

Abraxas concinna, Warren, Novit. Zool. i. p. 421 (1894).

Described from Thibet. My collectors did not meet with this species.

Abraxas grossulariata.

Phal. Geometra grossulariata, Linn. Syst. Nat. x. p. 525.

Abraxas conspurcata, Butl. Ill. Typ. Lep. Het. iii. p. 48, pl. lii. fig. 11 (1879).

Abraxas flavisinuata, Warren, Novit. Zool. i. p. 420 (1894).

There were four examples of the *conspurcata* form from Oiwake and two of the *flavisinuata* form from Fujisan in Pryer's collection.

In the form *conspurcata* the markings on secondaries are

certainly more decided than in any European specimen of *grossulariata* that I have seen, but the pattern is only a complete development of markings seen more or less clearly indicated in the majority of European *grossulariata*. Neither of the Japanese forms of this species diverge so widely from the type as do certain varieties of the species known to British entomologists.

I have received a nice series from Chang-yang, taken in July. In these specimens the markings on primaries are somewhat similar to those of *A. picaria*, Moore, but the markings on secondaries are much the same as in typical *A. grossulariata*, though not so pronounced—fuscous instead of black on all the wings. The yellow markings are in all cases less distinct, and in several specimens entirely obsolete. I propose the name *sinicaria* for this form.

Distribution. Europe; Siberia; Amur; Japan; Central China.

— *Abraxas picaria*.

Abraxas picaria, Moore, Proc. Zool. Soc. Lond. 1867, p. 652.

Appears to be a common species in Western China, occurring in July and August.

Specimens of the typical form exhibit considerable modification in the amount of black on primaries; in some examples this colour largely predominates. In addition to what may be regarded as ordinary aberration, there are three forms of the species from Western China, each of which appears to be worthy of a distinctive name.

—Var. *tortuosaria*, nov.

In this form the only prominent markings on the primaries are the costal portions of subbasal line, the discal spot, the sinuous and deeply angled transverse line beyond the middle, and a series of spots on outer margin; the secondaries are only sparsely dotted with fuscous on basal area, but the other markings are much as in the type.

Ta-chien-lu, Omei-shan, Moupin: July.

—Var. *grisearia*, nov.

Primaries whitish, heavily clouded and spotted with grey; the base is yellow, edged with black; discal spot black, with a black cloud-like spot before it on the costa, from the last there is sometimes a blackish shade extending to inner margin; submarginal band blackish, mixed with yellow, elbowed just above the middle. Secondaries whitish, spotted

with blackish, especially on abdominal area, which is tinged with yellowish; discal spot blackish; a yellow band dotted or edged with black extends from just above anal angle to a little beyond third median nervule. Fringes grey on primaries, whitish on secondaries, preceded on each wing by a row of black spots. Under surface similar to the upper-side, but the transverse markings are not distinct on primaries and there is a black spot on the middle of the costa of secondaries.

Expanse 44-46 millim.

Nine male specimens from Pu-tsu-fong, July.

—*Var. nebularia*, nov.

Primaries whitish, mottled and clouded with smoky brown; discal spot blackish, placed in the lower end of a cloud on costal area; basal area marked with yellow; beyond the middle of the wing there is a yellow irregular line, but this is not clearly defined. Secondaries whitish, sprinkled with brownish; there is a small cloud-like spot on the middle of the abdominal margin, and a short dash of yellow, bordered on each side by brownish spots, above anal angle; central spot blackish. Fringes brownish, marked with whitish at ends of the nervules. Under surface similar to above, but the yellow markings of primaries are absent and there are some yellow hairs at the base of secondaries.

Expanse 44-54 millim.

I have a long and rather variable series of this form, the specimens comprised therein being from Ta-chien-lu, Pu-tsu-fong, Ni-tou, Wa-shan, Omei-shan, and Chia-ting-fu: July..

Distribution. Kumaun; Sikhim (*Hampson*); Western China.

—*Abraxas punctisignaria*, sp. n. (Pl. VII. fig. 13.)

Primaries pale yellowish buff, marked with yellow at the base of costa and sparingly spotted with black; the most conspicuous of these spots are three or four on basal portion of costa and a transverse series beyond the middle of the wing, the spots forming the lower portion of the series are rather larger than the others and are placed on a yellow abbreviated band from the inner margin. Secondaries paler than primaries, but more liberally spotted with black, the central series followed on abdominal margin by a yellow patch; all the wings have a black discal spot. Fringes pale yellowish buff. Under surface similar in colour to that of the upperside of the secondaries; black markings as above,

but there is no trace of yellow. Body yellow, marked with black on the back and sides,

Expanse 40 millim.

Two male specimens: one from Moupin, July, and one from the summit of Omei-shan, August.

Hab. Western China.

Abrazas flavobasalis, sp. n.

Male.—Creamy white; basal area of primaries yellow, spotted with black and limited by a black macular line elbowed at costa; some blackish spots beyond the discal spot form fairly regular central and submarginal series, the latter outwardly bordered towards the inner margin with yellow; marginal series much interrupted and not well defined. Secondaries have a blackish spot at the base and some other spots of the same colour arranged in three transverse series, the middle series bordered with yellow towards anal angle. Under surface whitish, spots as above, but no yellow markings. Body yellowish, marked on the sides of abdomen with black and also on the dorsal surface of the seventh, eighth, and ninth segments.

Female.—Similar to the male, but the ground-colour is rather whiter.

Expanse, ♂ 36, ♀ 39 millim.

One example of each sex from Chang-yang, July.

Hab. Central China.

Abrazas punctaria, sp. n.

Female.—Yellowish buff. Basal area of primaries yellow, dotted with black and limited by three black dots, one on the median and submedian nervures respectively and one between the costa and subcostal nervure; beyond the discal spot there are four transverse series of black dots, with a short yellow band between the second and third, starting from inner margin. Secondaries have four transverse series of black dots, with a yellow abbreviated band between the second and third, as on primaries; immediately preceding the innermost of these series there are some diffuse dots above the abdominal margin. Under surface whiter than above; transverse series of dots hardly so distinct; no yellow markings. Head and thorax yellow, dotted with black; abdomen pale yellowish, with a black dot on the back and side of each segment except the terminal one and that next the thorax.

Expanse 32 millim.

One female specimen from Moupin, July.

Hab. Western China.

-Abraxas reticularia, sp. n.

Primaries white, sparingly dotted with brownish; traversed by two diffuse blackish-brown transverse bands and a diffuse longitudinal band of the same colour; the outer of the transverse bands is bifurcate on the costa and expands on the inner margin, sometimes it is intersected by a thin whitish line; above the black discal spot there is a blackish cloud, from which a spur descends to longitudinal band. Secondaries white, speckled with brownish and exhibiting traces of a brownish central band; discal spot blackish. Fringes white, more or less chequered with brownish. Under surface similar to the upper. Body yellow, marked with black.

Expanse 40-44 millim.

Five male specimens and one female from Ta-chien-lu, Omei-shan, Ni-tou, and Che-tou: July.

Hab. Western China.

-Abraxas curvilinearis, sp. n. (Pl. VII. fig. 12.)

White. Primaries sparingly freckled with greyish brown; basal patch dark ochreous, bordered with brown; discal spot brown, surmounted by a brownish cloud on costa; there is a transverse curved and recurved brown band beyond the middle, expanding towards inner margin. Secondaries have a series of five brownish spots, terminating in a brownish bar, outwardly bordered with yellow, on abdominal margin. Under surface: colour as above, markings faintly reproduced.

Expanse, ♂ 44, ♀ 46 millim.

One example of each sex from Chia-ting-fu, July.

Hab. Western China.

Genus *LIGDIA*.

(Guen. Phal. ii. p. 209 (1857).)

Ligdia japonaria, sp. n. (Pl. VII. fig. 1.)

White. Basal area of primaries smoky brown, spotted with black and limited by a curved series of black spots; above the anal angle there is a smoky-brown patch, intersected by the median nervules and connected by a narrow blackish band with a blackish blotch on the costa; discal spot blackish, with a spot above it on the costa and one below it on inner margin, and there are some spots and clouds of the same colour on the outer marginal area. Secondaries have a blackish central spot and broad transverse band, and there are some marks of the same colour on abdominal margin

and also on the outer margin. Fringes greyish white, marked with darker on primaries. Under surface similar to above, but the basal area of primaries is clouded with blackish and all the markings are of the same colour.

Expanse, ♂ 28, ♀ 31 millim.

Several specimens in Pryer's collection from Oiwake.

Hab. Japan.

Allied to *L. adustata*, Schiff.

Ligdia ciliaria, sp. n.

White. Primaries have a blackish basal patch and border on outer margin, the latter is broadly interrupted in the middle; discal spot black. Secondaries have a black discal spot and the outer margin is bordered as on primaries; there is a blackish cloud on the middle of the abdominal margin; all the dark patches are suffused with golden brown. Fringes golden brown, marked with a rather darker shade. Under-side similar to above, but the borders are not quite so broad.

Expanse 28 millim.

One female specimen from Oiwake in Pryer's collection.

Hab. Japan.

Also allied to *L. adustata*, Schiff.

Genus *LOMASPILIS*.

(Hübner. Verz. Schmett. p. 316.)

Lomaspilis marginata.

Phal. Geometra marginata, Linn. Syst. Nat. x. p. 527; Clerck, Icon. pl. ii. fig. 5.

Abraxas marginata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 116.

Lomaspilis opis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 442 (1878);

Ill. Typ. Lep. Het. iii. p. 49, pl. liii. fig. 3 (1879).

There were several specimens from Oiwake, Nikko, and Yesso in Pryer's collection. I have also received the species from Chang-yang, June.

Most of the Japanese examples of *L. marginata* in my series are referable to the form which Butler has named *opsis*, but some are very typical.

Gräser also records var. *opsis* from Amurland (Berl. ent. Zeit. 1888, p. 391).

Distribution. Europe; Amur; Japan; Yesso; Central China.

Genus METABRAXAS.

(Butl. Trans. Ent. Soc. Lond. 1881, p. 410.)

- *Metabrazas clerica*.

Metabrazas clerica, Butl. Trans. Ent. Soc. Lond. 1881, p. 410.

Metabrazas clerica, var. *inconfusa*, Warren, Novit. Zool. i. p. 415 (1894).

There were a few specimens from Oiwake and Yesso in Pryer's collection.

I captured several examples at Hakodate in August, and have received one female from Chang-yang, where it was taken in July. Butler's type was from Tokio.

The black spots are variable in size and degree of confluency; in var. *inconfusa*, Warr., they are well separated.

Distribution. Japan; Yesso; Central China.

- *Metabrazas luridaria*, sp. n.

White. Basal area of primaries leaden grey, marked with ochreous; costa broadly marked with leaden grey; central fascia, submarginal and marginal bands also leaden grey, the first two macular, the second united with the third on apical area and also towards inner margin. Secondaries have the following leaden-grey markings:—a spot on median nervure, with one between it and a spot on abdominal margin; a central fascia, the middle portion of which is broken up into twin spots; a macular submarginal and a marginal band united as on primaries. Fringes grey. Under surface as above, but the base of the primaries is not marked with ochreous. Antennæ of the male ciliated. Head brownish grey, face whitish. Thorax light brown, marked with darker. Abdomen grey, with two black spots on each segment above. Legs grey.

Expanse 54 millim.

One male example from Moupin, July.

Hab. Western China.

In general appearance this species greatly resembles *M. rufonotaria*, but the antennæ of the male are different in structure and the arrangement of the markings, although very similar, is not identical.

- *Metabrazas rufonotaria*, sp. n.

White, with leaden-grey and brownish markings. On the primaries the leaden-grey markings comprise a basal patch and a streak along the costa, a broad central fascia interrupted

just above the middle; a submarginal band, also interrupted above the middle, and only separated from the marginal band by a transverse row of spots of the ground-colour; between the basal patch and central fascia there is a short interrupted dash from the costa; the brownish marks are placed on the basal patch and costal portion of short dash beyond and also on the costal and inner marginal portions of the central fascia. Secondaries have a blackish discal spot and a smaller spot on the first fork of median nervure; the leaden-grey central fascia is interrupted about the middle and sometimes before inner margin; marginal and submarginal bands as on primaries, but the latter is not marked with brown. Fringes dark grey in the male, paler in the female. Under surface as above, but there are no brownish markings on primaries. Antennæ of the male bipectinated. Head greyish, face brownish. Thorax grey, marked with brown. Abdomen yellow, with two black spots on each segment above. Legs yellow, tarsi marked with black.

Expanse, ♂ 54, ♀ 56 millim.

Four specimens (three males and one female) from Omeishan, July.

Hab. Western China.

Metabrazas incompositaria, sp. n.

Male.—White, spotted and marked with dingy grey. On the primaries these markings represent a basal patch and central fascia, with a short band between them from costa to discal spot, and a broad band on outer marginal area, the last is composed of smaller spots. Secondaries have an interrupted central band, a discal spot, and some smaller spots between it and the base of the wing; some scattered spots on outer marginal area. Fringes grey, narrowly interrupted with white on the secondaries and towards the inner angle of primaries. Under surface: markings as above, but blacker. Antennæ of the male bipectinated. Head and thorax yellow, spotted with black, face blackish. Abdomen yellowish. Legs grey, marked with blackish.

Female.—Similar to the male, but the spots on basal and inner marginal areas are smaller and those on outer marginal area fewer in number, especially on the secondaries.

Expanse 62 millim.

Seven male specimens and one female from Chang-yang, June.

Hab. Central China.

— *Metabrazas molossaria*.

Abraxas molossaria, Oberth. Etud. d'Entom. x. p. 32, pl. iii. fig. 10 (1884).

This species is described by Oberthür from Tong-Tchéou (province of Kwei-chow). My collectors did not meet with it in any part of China that they visited.

Oberthür states that this is a variable species and that he has received a melanic form of it from Northern India.

Hab. Western China.

— *Metabrazas* (?) *nigromarginaria*, sp. n.

White, with broad fuliginous borders to all the wings; these borders are preceded by a series of spots of the same colour; on the primaries there are, in addition, a broad fuliginous streak along the costal portion of the basal third of the wing and some yellow markings at the extreme base; discal spot black, with a short interrupted band beyond; the apical portion of the marginal border of primaries is very broad and encloses some spots of the ground-colour; the inner marginal area of these wings is rather thickly spotted with fuliginous. Secondaries have a few dark spots at their base. Fringes of primaries fuliginous, slightly marked with white; of secondaries white, chequered with fuliginous. Under surface as above. Antennæ bipectinated nearly to the tip. Body black, marked with yellow.

Expanse 54 millim.

One male specimen from Wa-shan, June.

Hab. Western China.

Genus *DILOPHODES*.

(Warren, Novit. Zool. i. p. 416 (1894).)

— *Dilophodes elegans*.

Abraxas elegans, Butl. Ill. Typ. Lep. Het. ii. p. 53, pl. xxxvii. fig. 6 (1878).

Dilophodes elegans, Warren, Novit. Zool. i. p. 416 (1894); Hampson, Fauna Brit. Ind., Moths, iii. p. 305 (1895).

Several specimens from Ohoyama, Nikko, and Gifu in Pryer's collection.

I captured the species in Satsuma in May, and Mr. Smith at Hakone in August. One male specimen was obtained by my collectors in the province of Kwei-chow, a female example at Omei-shan, and several specimens at Chang-yang: July.

Ann. & Mag. N. Hist. Ser. 6. Vol. xix.

82

The black markings of the Japanese specimens are larger and more confluent than in Chinese examples.

Distribution. Japan; Western and Central China. Khásis (Hampson).

Dilophodes conspicuaria, sp. n.

White, marked with black. Primaries spotted on basal area; central fascia interrupted, broadest on costa; outer marginal area banded with black; this band, which is narrowest in the middle, is intersected with white or whitish along the neuration and traversed by a white line; between the central fascia and marginal band is a spot on costa, sometimes united with the former. Secondaries have a spot at the base and one between it and the discal spot; there is also a spot on the middle of abdominal margin; outer marginal area as on primaries. Fringes of primaries black, tending to grey towards the inner angle; those of secondaries are pale grey. Under surface similar to the upperside, but there is a broad black dash along the costa of secondaries extending from basal spot to outer marginal band. Head and thorax ochreous, the latter spotted above with black and the patagia marked with whitish; abdomen white, dorsally marked with black, and the terminal segment with a tuft of long silky grey hairs.

Expanse ♂ 58-64, ♀ 52-60 millim.

There were two male specimens and four females from Gifu in Pryer's collection. I have also received two males from Central China, where they were captured at a place thirty miles north-west of Ichang in July; in one of these the line traversing the outer marginal border is obsolete.

Distribution. Japan; Central China.

Genus PERCNIÁ.

(Guen. Phal. ii. p. 216 (1857).)

— *Percnia foraria*.

Percnia foraria, Guen. Phal. ii. p. 217 (1857); Leech, Trans. Ent. Soc. Lond. 1889, p. 146; Hampson, Fauna Brit. Ind., Moths, iii. p. 307 (1895).

Xenophia foraria, Warren, Novit. Zool. i. p. 415 (1894).

There were a few specimens from Yokohama in Pryer's collection.

I received the species from Chang-yang, Kiukiang, Omei-shan, and the province of Kwei-chow: June and July.

Distribution. Dharmasála; Simla; Sikhim (Hampson); Japan; Central and Western China.

—*Percnia belluaria*.

Percnia belluaria, Guen. Phal. ii. p. 217 (1857).

Percnia guttata, Feld. Reis. Nov. v. pl. cxxx. fig. 15, ♂ (1874).

Percnia belluaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 308 (1895).

Three specimens from Chang-yang, one from Wa-shan, four from Pu-tsu-fong, and one from Omei-shan: June and July. I took this species in September in Southern Kashmir and I have received it from Kulu.

Distribution. Sikhim; Khâsis (*Hampson*); Kulu; Kashmir; Central and Western China.

—*Percnia grisearia*, sp. n.

Male.—Whitish. Primaries tinged with cinnamon-grey at the base and clouded with blackish on basal half; all the wings are traversed by series of black dots arranged as in *P. fumidaria*, but the bands are blackish grey and considerably interrupted, especially on the lower portion of outer margin of primaries and on the secondaries. Fringes whitish grey, becoming darker towards apex of primaries. Under surface of primaries much clouded with blackish grey, that of secondaries very similar to upperside, but the markings are rather paler. Thorax and abdomen cinnamon-grey, spotted with black.

Female.—Wings rather more ample; outer margin of primaries rounder. The blackish-grey central band of primaries is much broken up and the bands on secondaries are almost obsolete; the under surface of primaries is free from blackish-grey clouding except on basal portion of costa and on apical area of primaries.

Expanse, ♂ 58, ♀ 60 millim.

Ten specimens (seven males, three females) from Kiu-kiang, Ichang, Chang-yang, Kwei-chow, and Chia-ting-fu.

Hab. Central and Western China.

This species and also *P. fumidaria* are allied to *P. belluaria*, Guen.

—*Percnia fumidaria*, sp. n.

Male.—Whitish. Primaries suffused with pinky grey on the basal half and traversed by five rows of black dots, those of central and two inner series placed on the nervation and those of outer series placed between the nervules; the central series is followed by a broad band of pinky grey and the space between the two outer series is grey, with the exception of some bars of the ground-colour between the opposed dots;

the discal spot is black and there are two black dots at the base of wing. On the secondaries the arrangement of black dots and pink-grey bands corresponds with that on primaries, except that there are only two black dots and the discal spot between the central series and the base of the wing. Fringes pinky grey. Under surface whitish; discal spot on all the wings black, larger than above and followed by a transverse series of short black dashes on the nervules; two outer series of dots as on upperside, but those of primaries obscured by a band of grey.

Female.—Similar to the male, but the wings are rather more ample, and the outer margin of primaries rounder; the pinky-grey suffusion is more restricted to basal area.

Expanse, ♂ 46, ♀ 52 millim.

Several examples of each sex from Chang-yang and Ichang and a pair from Chia-ting-fu: July.

Hab. Central and Western China.

— *Percnia giraffata*.

Abraxas giraffata, Guen. Phal. ii. p. 205 (1857).

Rhyparia grandaria, Feld. Wien. ent. Mon. 1862, p. 39; Reise Nov. pl. cxxix. fig. 28 (1874).

Percnia giraffata, Hampson, Fauna Brit. Ind., Moths, iii. p. 309 (1895).

Two specimens from Fujisan in Pryer's collection. Three specimens from Chang-yang, one from Wa-shan, two from Omei-shan, one from Moupin, and one from the province of Kwei-chow: June.

Distribution. Sikkim and Burma (*Hampson*); Japan; Central and Western China.

— *Percnia exanthemata*.

Culcula exanthemata, Moore, Lep. Atk. p. 266 (1887).

Percnia exanthemata, Hampson, Fauna Brit. Ind., Moths, iii. p. 308 (1895).

Buzura abraxata, Leech, Trans. Ent. Soc. Lond. 1889, p. 143, pl. ix. fig. 14, ♀.

I received specimens of this species from Kiukiang, Moupin, and Omei-shan, all taken in July.

The males range from 64–72 millim. in expanse and the females from 74–90 millim.

Distribution. Sikkim; Khasis (*Hampson*); Central and Western China.

Genus OBEIDIA.

(Walk. Cat. Lep. Het. xxiv. p. 1139 (1862).)

—*Obeidia vagipardata*.

Obeidia vagipardata, Walk. Cat. Lep. Het. xxiv. p. 1139 (1862).

Common at Chang-yang, Kiukiang, and in all the localities visited by my collectors: June and July.

There is considerable variation in the size of the black spots; those on the secondaries are often confluent and form more or less complete bands. In one male specimen from the province of Kwei-chow the secondaries are almost entirely blackish and the outer and inner marginal areas of primaries are broadly marked with the same colour.

Hab. Central and Western China.

—*Obeidia rongaria*.

Rhyparia rongaria, Oberth. Etud. d'Entom. xviii. p. 35, pl. ii. fig. 22 (1893).

Described by Oberthür from a specimen received by him from Tsé-kou.

Hab. Western China.

—*Obeidia idaria*.

Rhyparia idaria, Oberth. Etud. d'Entom. xviii. p. 35, pl. v. fig. 73 (1893).

Oberthür's type was from Tsé-kou.

Hab. Western China.

—*Obeidia tigrata*.

Abraxas tigrata, Guen. Phal. ii. p. 202 (1857).

Obeidia tigrata, Hampson, Fauna Brit. Ind., Moths, iii. p. 309, fig. (1895).

Rhyparia leopardaria, Oberth. Etud. d'Entom. vi. p. 17, pl. ix. fig. 5 (1881).

A large number of specimens were received from Moupin, Omei-shan, Chia-ting-fu, Kiukiang, and Chang-yang: June and July. I captured the species at Gensan in July.

This species varies in expanse, in the tone of the yellow coloration, and also in the size of the black spots; in some specimens the spots on secondaries are confluent and form bands.

Leopardaria, Oberth., is certainly a form of this species;

I have a specimen from Moupin which is almost exactly identical with Oberthür's figure.

Distribution. Sikhim; Nágas; Penang (*Hampson*); Corea; Central and Western China.

—*Obeidia gigantearia*, sp. n.

Male.—Yellow, central area of all the wings white; basal, costal, and marginal areas heavily spotted with black. All the wings have a black irregular fascia and a diffuse submarginal band: there is also a more or less complete subbasal band on the secondaries. Fringes yellow, chequered with black. Under surface as above.

Female.—Similar to the male, but the central fascia and submarginal band on all the wings are broken up into spots, as also is the subbasal band on secondaries.

Expanse 86–92 millim.

A large number of specimens from the province of Kweichow and from Omei-shan and Moupin, also one example from Chang-yang: June and July.

Hab. Central and Western China.

—*Obeidia conspurcata*, sp. n.

Male.—Yellow, central area of all the wings white; basal, costal, and marginal areas spotted with blackish; all the wings have a broad central fascia and an ill-defined submarginal band, the former composed of large blackish spots and the latter of smaller spots. Fringes yellow, chequered with blackish. Under surface as above.

Female.—Similar to the male, but the wings are rather more ample and the spots forming the central fascia are smaller and more scattered.

Expanse 70–72 millim.

A long series from Chang-yang, also several specimens from Omei-shan, Moupin, and Kweichow: July.

Hab. Central and Western China.

This species is very like *O. gigantearia*, but it is smaller and the maculation is not so black or so heavy, and the bands are never so well defined.

—*Obeidia* (?) *Largeteui*.

Rhyparia Largeteui, Oberth. Etud. d'Entom. x. p. 32, pl. i. fig. 5 (1884).

Appears to be common at Ichang, Chang-yang, and Omei-shan. I also received one specimen from Chia-ting-fu: June and July.

Hab. Central and Western China.

Obeidia (?) *aurantiaca*.

Hulthia aurantiaca, Alph. Rom. sur Lép. vi. p. 53, pl. iii. fig. 2, ♂ (1892).

Alphéraky records a male specimen from the river Hei-hò, in the province of Kan-Sou : July.

Genus VITHORA.

(Walk. Cat. Lep. Het. iv. p. 818 (1855).)

Vithora stratonice.

Phalena stratonice, Cram. Pap. Exot. iv. p. 234, pl. cccxcviii. fig. K.

Cystidia stratonice, Hübner. Verz. Schm. p. 174 (1800).

Vithora agrionides, Butl. Ann. & Mag. Nat. Hist. (4) xv. p. 137 (1875); Ill. Typ. Lep. Het. pt. ii. p. 3, pl. xxii. fig. 3 (1878).

Vithora stratonice, Leech, Proc. Zool. Soc. Lond. 1888, p. 614.

Cistidia stratonice, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 116.

I met with this species at many places in Japan during the months of May, June, and July; at Gensan in June; and I have received two specimens from Kiukiang.

Distribution. Japan; Corea; Central China.

— *Vithora indrasana*.

Vithora indrasana, Moore, Proc. Zool. Soc. Lond. 1885, p. 706, pl. xlii. fig. 5.

Halkia nigripars, Swinh. Trans. Ent. Soc. Lond. 1892, p. 16, pl. i. fig. 1.

Vithora indrasana, Hampson, Fauna Brit. Ind., Moths, iii. p. 311 (1895).

I have a long series of this species from Moupin and Omeishan, captured in July.

Distribution. Sikkim; Khásis (Hampson); Western China.

The specimens agree better with the form *nigripars* from Khásis than with Sikkim specimens. The central white markings on secondaries, however, are smaller, especially the dash in cell, which is represented by a patch in the cell and a small spot just outside.

— *Vithora couaggaria*.

Abraxas couaggaria, Guen. Phal. ii. p. 202 (1857).

Halkia euryptyle, Mén. Bull. de l'Acad. Pét. xvii. p. 217; Schr. Amur-Reise, p. 47, pl. iv. fig. 3 (1850).

Halkia euryptyle, Motsch. Etud. d'Ent. 1860, p. 30.

Cistidia couaggaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 116.

Abraxas interruptaria, Feld. Wien. ent. Mon. 1862, p. 39; Reise der Nov. pl. cxxix. fig. 20; Leech, Trans. Ent. Soc. Lond. 1889, p. 145.

Abraxas lithosiaria, Walk. Cat. Lep. Het. xxiv. p. 1125 (1862).

There were several specimens in Pryer's collection, and I

captured some fine examples at Nagahama and Gensan in July. I have also received the species from several Chinese localities.

Distribution. Japan; Corea; Amur; Central and Western China.

The very extensive series that I have retained comprises all the intergrades between a specimen which is white in ground-colour, with narrow black bands, and one which is black in colour, with three small white spots on the basal area and two spots, rather larger, on the outer third of primaries. The secondaries of this specimen are black, with two white bands.

— Genus NEOLYTHRIA.

(Alph. Rom. sur Lép. vi. p. 72 (1892).)

— *Neolythria djrouchiaria*.

Abraxas djrouchiaria, Oberth. Etud. d'Entom. xviii. p. 34, pl. iii. fig. 37 (1898).

I received a number of specimens from Ta-chien-lu, Moupin, and Che-tou. In some of these the black transverse band of primaries is not intersected by a yellow line.

— Var. *montana*, nov. (Pl. VII. fig. 11.)

Smaller than the type; the transverse band of primaries is broader, the black spots on outer margin of each wing are united and form a marginal band, the secondaries have a distinct macular submarginal band.

A long series was taken on the summit of Mount Omei in August.

In one female example of this form the ground of primaries is yellowish, and the secondaries are tinged with the same colour.

Hab. Western China.

— *Neolythria abraxaria*.

Neolythria abraxaria, Alph. Rom. sur Lép. vi. p. 72, pl. iii. figs. 8 a, b (1892).

This species was first discovered in the province of Szechuen. The specimens I have received from Western China do not agree with the type; I therefore describe them as var. *confinaria*, nov.

In this form the white submarginal band on primaries is much narrower and its edges are serrated; the lower discal streak is shorter, and there is sometimes a small triangular

spot between this and the upper streak; on the secondaries the marginal black spots are larger.

Three specimens from Che-tou and two from Ta-chien-lu, July.

Hab. Western China.

—*Neolythria tandjrinaria*.

Abrazas tandjrinaria, Oberth. Etud. d'Entom. xviii. p. 84, pl. ii. fig. 23 (1893).

Occurs not uncommonly at Chin-kou-ho, Wa-shan, Huang-mu-chang, and Chang-yang: June and July.

Among the specimens from Chin-kou-ho was an example of the female, and as this sex has not been previously described, I append a short description.

Female.—Yellow band, together with the black internal border, on outer margin of primaries much narrower than in the male; the inner row of spots only represented by two or three on the costal portion. On the secondaries the spots of the inner row on outer margin are linear and almost touching the outer ones.

Hab. Western and Central China.

—*Neolythria consimilaria*, sp. n.

Similar to *A. tandjrinaria*, Oberth., but the black border of the yellow band on outer margin of primaries, which is rather fulvous in tint, is deeply indented on costal area; the black spots forming the inner series are larger, especially the costal one and that below it; the two rows of black spots on outer margin of secondaries are wider apart; all the wings have a distinct black discal spot.

Expanse 30–32 millim.

Several specimens (all males) from Wa-szu-kow; examples have also been received from Ta-chien-lu and Pu-tsu-fong: June and July.

Hab. Western China.

—*Neolythria Oberthuri*, sp. n. (Pl. VII. fig. 6.)

Also similar to *A. tandjrinaria*, Oberth., but the outer marginal band of primaries is not tapered, but of almost uniform width from costa to inner margin; the inner row of black spots is free and does not unite with the black bordering line at any point. On the secondaries the marginal series of black spots are even wider apart than in *A. consimilaria*, and there is a black dot on each nervule before the inner series;

the black discal spot of primaries is linear and slightly curved, that on secondaries, when present, is punctiform.

Expanse, ♂ 36, ♀ 38 millim.

Seven male specimens and three females from Moupin and Huang-mu-chang: July and August.

Hab. Western China.

— *Neolythria nubiferaria*, sp. n.

White, slightly tinged with smoky, venation blackish. Primaries: costa blackish, most broadly so near the white transverse line, which precedes a deep blackish border on outer margin; discal spot black. Secondaries have a small black discal spot. Fringes whitish, preceded by a series of blackish lunules. Under surface similar to above.

Expanse, ♂ 26, ♀ 28 millim.

One example of each sex from How-kow.

Hab. Thibet.

Genus XANTHABRAXAS.

(Warren, Novit. Zool. i. p. 422 (1894).)

— *Xanthabrazas hemionata*.

Abraxas hemionata, Guen. Phal. ii. p. 208 (1857).

Xanthabrazas hemionata, Warren, Novit. Zool. i. p. 422 (1894).

I received four specimens from Chang-yang, one from Kiu-kiang, and five from Moupin: July.

Hab. Central and Western China.

EXPLANATION OF THE PLATES.

PLATE VI.

- Fig. 1. *Heteroculia truncaria*, sp. n., p. 212.
- Fig. 2. *Urapteryx subpunctaria*, Leech, p. 192.
- Fig. 3. — *similaria*, sp. n., p. 192.
- Fig. 4. *Anonychia preclitaria*, sp. n., p. 226.
- Fig. 5. *Xylascia biangularia*, sp. n., p. 210.
- Fig. 6. *Oberthüreria nigromaculata*, sp. n., p. 189.
- Fig. 7. — *flavomarginaria*, sp. n., p. 188.
- Fig. 8. *Heterolocha quadraria*, sp. n., p. 231.
- Fig. 9. *Itunna trimaculata*, sp. n., p. 298.
- Fig. 10. *Kranunda lucidaria*, sp. n., p. 305.
- Fig. 11. *Psychostrophia picaria*, sp. n., p. 189.
- Fig. 12. *Venilia flavaria*, sp. n., p. 233.
- Fig. 13. *Myrteta sinensaria*, sp. n., p. 195.
- Fig. 14. *Macaria elongaria*, sp. n., p. 308.
- Fig. 15. *Pericallia marmorataria*, sp. n., p. 207.

PLATE VII.

- Fig. 1. *Ligia japonica*, Leech, p. 449.
 Fig. 2. *Boarmia venustaria*, Leech, p. 414.
 Fig. 3. *Phyllabraxas curvata*, sp. n., p. 441.
 Fig. 4. *Boarmia decoloraria*, sp. n., p. 424.
 Fig. 5. — *fumosaria*, Leech, p. 417.
 Fig. 6. *Neolythria Oberthuri*, sp. n., p. 461.
 Fig. 7. *Selenia adustaria*, Leech, p. 205.
 Fig. 8. *Bidon emarginaria*, sp. n., p. 322.
 Fig. 9. *Hemerophila conjunctaria*, sp. n., p. 431.
 Fig. 10. *Arichanna albomaculata*, Leech, p. 436.
 Fig. 11. *Neolythria djouchiaria*, Oberth., var. *montana*, nov., p. 400.
 Fig. 12. *Abraxas curvilinearis*, sp. n., p. 449.
 Fig. 13. — *punctisignaria*, sp. n., p. 447.
 Fig. 14. *Boarmia basifuscaria*, Leech, p. 416.
 Fig. 15. — *ornataria*, Leech, p. 417.

XLIV.—Descriptions of Two new Muridæ from Central and West Africa. By W. E. DE WINTON.

THE examination of some specimens of West-African Muridæ lately acquired by the British Museum and kindly entrusted to me for determination by Mr. Oldfield Thomas shows the necessity for descriptions being drawn out and names given to two forms. One I propose to name *Mus sebastianus*, the peculiarity of the fur suggesting arrows sticking in its skin. The other I name *Malacomys centralis*; the examples of this species were collected and presented to the British Museum by Dr. Emin Pasha ten years ago, and referred to by Thomas (P. Z. S. 1888, p. 11) as *M. longipes*, but have until now never been compared with specimens of *M. longipes*, M.-Edw. The Museum has since acquired several specimens of this West-African form.

Mus sebastianus, sp. n.

Size rather smaller than *M. rattus*: whole of the upper parts dull coffee-brown, fur soft and rather woolly, interspersed with long shining lance-shaped darker hairs; beneath greyish white, not sharply separated from the colour of the upper parts; feet and hands covered with fine short adpressed brown hairs; nails pale horn-colour, small on the fore feet, those on the hind feet much larger and stronger, curved, but not very sharp; front part of the face and nose thickly haired; whiskers all black-brown, long, reaching well beyond ears; in the alcoholic specimens the ear laid forward just reaches to postcanthus of the eye; tail very long, unicoloured dark slate, smooth and practically naked.

The general colour of this mouse seems to come between "vandyke" and "burnt umber" of Ridgway. The long shining hairs are very conspicuous, as they are fully twice the length of the rest of the coat and wave with their own weight as the specimen is turned about in the hand; a closer examination shows that these hairs are of very peculiar shape, being exceedingly fine for more than half their length, then increasing several diameters and ending in a point; thus, when a single hair is extracted and laid on the table it resembles a miniature porcupine-quill on the end of a fine piece of wire. The fore feet are very typical of the genus, and there is nothing out of the common in the structure of the hind feet; the first toe reaches to base of second, fifth to end of first phalanx of fourth; pads, first four are large, last two small, all pointed; soles smooth and naked.

Type, ♀ in al. (97. 2. 21. 4 in British Museum):—Mammæ 1—2=6. Head and body 141 millim.; tail 190; hind foot 29; ear 18.

A younger ♂:—Head and body 132; tail 185; hind foot 28; ear 17.

Loc. Efulen, Cameroons.

The skull somewhat resembles that of *M. univittatus*, but is more ridged. In profile it is arched; it is rather short and broad, bumpy and angular; supraorbital and temporal ridges strongly developed, forming well-marked angles at the junction of the frontals and parietals, and also in the middle of the latter over posterior roots of zygomatica; the ridges continue back to join the occipital ridge, forming a polygonal pattern on the top of the skull, only open across the inter-orbital constriction; the zygomatica, bowed evenly downwards, are of nearly equal thickness throughout. Auditory bullæ very small. The molars are exceedingly simple; in neither of the specimens to hand is there any sign of cusps, and the pattern of the enamel folds is perfectly plain, with none of the minor folds found in a greater or less degree of development in the teeth of nearly every member of the genus. Upper incisors orange-yellow, lower rather paler. The palatal foramina barely reach a line drawn between the front roots of molars; the postnarial opening is rounded and open, the back of the palate barely extending to the level of the back of the molar series.

Mandibles short and deep, condyles set very high nearly to level of coronoids, which are small; the back line is very little bowed in from the perpendicular.

Skull measurements:—Greatest length 37.5 millim., greatest breadth 18.5; breadth of brain-case 15, constr. 6.5;

interpar. 5×10 ; nasals 13×4.5 ; basal length 31.5; hens. to back of pal. 16.5; back of pal. to for. mag. 12.5; pal. for. 8×2.7 ; $\frac{ma}{me}$ 6.1; diast. 10; outside $\frac{ma}{me}$ 7.8, inside 3.5; mandible, length (bone only) 20, height 12.1.

This mouse may possibly be identical with *M. hypoleucus*, Pucher.; but as that name had already been applied to a mouse from Natal by Sundevall (Öfvers. Vet.-Ak. Stockh. 1846, p. 121), it cannot be considered.

I think there is no doubt that we here have the animal described by Prof. Tullberg ('Muriden aus Kamerun,' p. 36, 1893) as *Dasymys longicaudatus*, which is certainly not a *Dasymys*, as is clearly shown in the figures given of the skull, and, being a *Mus*, the specific name cannot stand, being rendered useless by having been applied by Bennett (P. Z. S. 1832, p. 2) to a South-American mouse now known as *Orizomys longicaudatus*. But, presuming this to be the case, it is scarcely credible that the very striking peculiarity in the fur could have remained unnoticed unless the season of the year prevented this peculiarity being apparent.

Prof. Tullberg sets *Mus univittatus* down as an *Isomys*: this mouse has a fairly well-marked dorsal streak, and its hind feet approach the *Isomys*, or, as it should be called, *Arvicanthis* form; but in every other character it is a true *Mus*. I feel sure that if more specimens had been examined *Mus (Isomys) rufocanus* would never have been described, for among the specimens of *Mus univittatus* in the British Museum from the same locality will be found variations greater than those separating these two forms, with every intermediate step. I shall therefore consider them as identical.

Malacomys centralis, sp. n.

Size rather larger than *M. longipes*, but in texture and colour of fur and proportions of all parts it closely resembles that species. The soft velvety fur is very shrew-like and suggests the colour of *Sorex minutus*. Ears very long and naked.

Colour above dull liver-brown, slightly mixed with grey, rather more golden on the head, neck, and rump; a dark oval sooty-coloured patch surrounds each eye; whiskers fine, long, liver-coloured; front part of the face very scantily haired; the whole of the underparts greyish; feet and hands clothed with extremely fine short whitish hairs, not much more developed than the bloom on a peach; tail distinctly bicoloured, but varying somewhat in clearness, smooth and naked.

Type, ♂ (87. 12. 1. 60 in British Museum). Measurements taken from skin:—Head and body 180 millim.; tail 175; hind foot 40; ear 25; heel to front of last foot-pad 20; fifth toe to half first phal. of fourth; first toe short, not reaching to base of second. Foot-pads 5, between bases of second and third toes, between bases of third and fourth, at base of fifth, at base of first, and one about its own length posterior to that at base of first.

Loc. Tingassi, Mombutu.

A female shows the mammae 1—2=6.

Skull (broken): length to lambda 35.5 millim.; breadth 18; breadth of brain-case 16.5; constr. 7; nasals 16.5 × 4.3; lens. to back of pal. 18.4; pal. for. 6.3 × 3; \overline{ma} 6; diast. 12.3; outside \overline{ma} 1 7.8, inside 4.5; mandible, length (bone only) 22, height 12.

In comparison with *M. longipes* the skull is larger, as also the length and breadth of the molars; the brain-case broader and more rounded; the angle of juncture of fronto-parietal suture more obtuse; and in the mandible the greater length of the coronoid is evident. This is now the third known species in this genus, and is larger than *M. longipes*, M.-Edw., from the Gaboon and Cameroons, or the more brightly coloured graceful form *M. Edwardsi*, Rocheb., from Liberia.

XLV.—On a new Species of *Lagidium* from the Eastern Coast of Patagonia. By OLDFIELD THOMAS.

THE genus *Lagidium* has not hitherto been known to occur away from the chain of the Andes, and it has therefore been with much interest that I have examined an example of this genus obtained in the hills near Chubut, Eastern Patagonia. By the kindness of Dr. Moreno, of the La Plata Museum, the specimen has been acquired by the British Museum.

On the whole, considering its geographical isolation, the Chubut *Lagidium* is surprisingly like the Andean forms, those from the southern end of the Andean chain being naturally most nearly allied to it, while the more northern ones, such as *L. peruanum* and *L. pallipes*, are considerably more distinct.

Though like, however, it cannot be assigned to any described species, and I would therefore propose to name it, in honour of the distinguished Director of the La Plata Museum,

Ligidium Moreni, sp. n.

Size large. General colour above silvery or pale ashy grey, without yellowish suffusion, paler than in any Andean specimen in the Museum. Dorsal line well marked, running from withers to loins. Whiskers black. Ears rather short, their backs thinly haired, brownish, with white edges. Belly buffy yellow, rather sharply defined from the grey of the back and sides; bases of hairs brownish grey as usual. Hands and feet white, with a faint buffy tinge. Tail black below, grizzled, with mixed black and white hairs above.

Skull large and heavy, with the muzzle much elongated, but the nasals shorter and less inflated than in many of the Andean forms; anteriorly these bones do not nearly reach forwards to the level of the gnathion, but stop short at the level of the middle of the anterior mesial palatal foramina; behind again they are markedly exceeded by the ascending processes of the premaxillaries, which surpass them by fully 5 millimetres. Brain-case broad and rounded. Posterior edge of palate level with the middle of $\frac{m}{2}$. Teeth as usual.

Dimensions of the type (an adult female) measured on the dried skin:—

Head and body (c.) 480 millim.; tail imperfect at tip; hind foot 102; ear 72.

Skull: basal length 78, greatest breadth 46; nasals 30×11.5 ; interorbital breadth 18.3, intertemporal breadth 23.5; brain-case, breadth 38.5; palate length from hensenion 41.5; diastema 27.2; palatal foramina 16.3×3.5 ; length of upper molar series (crowns only) 19.2.

Hab. Chubut, Patagonia.

Type: B. M. 96. 10. 7. 7.

XLVI.—*Description of a new Lizard from Obok.*

By G. A. BOULENGER, F.R.S.

Eremias Martini.

Snout moderately long, obtusely pointed. Nostril between three swollen nasals; frontonasal separated from the rostral by the upper nasals; two præfrontals; no frontal groove; four supraoculars, first and fourth very small, first in contact with the loreal, second in contact with the præfrontal; a series of granules between the two principal supraoculars and the supraciliaries; interparietal elongate pentagonal, in contact with a small occipital; temporal

scales granular, smooth; no auricular denticulation; lower eyelid scaly; subocular bordering the lip, between the fourth and fifth upper labials; the three anterior pairs of chin-shields in contact. A feeble transverse gular fold, connecting the ears; collar distinct only at the sides. Dorsal scales rhomboidal, subimbricate, obtusely tectiform, 37 across the middle of the body. Ventral plates in straight longitudinal and transverse series, broader than long and subequal in size, in 8 longitudinal and 26 transverse series. A large præanal shield, bordered by two semicircles of scales. The hind limb reaches halfway between the arm and the ear. One series of large and two series of small subtibial shields. 12 femoral pores. Tail twice and a half the length of head and body; upper caudal scales strongly keeled, lower smooth. Sandy grey above, with three blackish streaks on each side, the middle one broadest, extending to the eye and separated from the lower one by a pure white stripe; lower parts uniform white.

	millim.
Total length	106
Head	7.5
Width of head	4.5
From end of snout to fore limb	14
From end of snout to vent	31
Fore limb	11
Hind limb	18
Tail	75

A single male specimen was obtained by Dr. Henry Martin in February 1895 on rocks about a mile from the coast of Obok, at the entrance of the Red Sea. It is now preserved in the private collection of his son in Paris.

It is interesting at the same time to record the occurrence of a sea-snake, *Hydrus platurus*, L.; on the same coast. A specimen was taken by fishermen in their nets among rocks near the coast and brought by them to Dr. Martin. No sea-snake had as yet been reported from the Red Sea or the Gulf of Aden.

XLVII.—Description of a new Genus and Species of Tortoises from Borneo. By G. A. BOULENGER, F.R.S.

LIEMYA.

Neural plates hexagonal, the antero-lateral sides shortest. Plastron extensively united to the carapace by suture, with moderately long axillary and inguinal buttresses, the latter ankylosed between the fifth and sixth costal plates; entoplastron anterior to the humero-pectoral suture. Skull with a broad bony temporal arch; alveolar surfaces of upper jaw

broad, with a strong median ridge; choanæ between the eyes. Skin of hinder part of head divided into small shields. Digits fully webbed. Tail very short.

Liemys inornata.

Carapace moderately depressed, smooth and rounded, the border not serrated; nuchal moderately large, an equilateral triangle with the apex turned forwards; vertebral shields narrower than costals, first, fourth, and fifth broader than long, second and third slightly longer than broad, with the antero-lateral borders convex and the postero-laterals concave; 25 marginals, including the nuchal. Plastron smaller than the opening of the shell, truncate anteriorly, deeply notched behind; the width of the bridge equals the length of the hind lobe; the suture between the gular shields equals that between the humerals and exceeds that between the anals; suture between the pectorals longer than that between the humerals, as long as that between the femorals, and two thirds that between the abdominals; suture between pectoral and abdominal curved; axillary and inguinal present. Head moderately large, short and broad; snout slightly shorter than the orbit, much less than the interorbital width; upper jaw notched in the middle, with a very indistinct cusp on each side; diameter of mandibular symphysis a little greater than the orbit. Digits webbed to the claws; front of forearm and outer side of leg with large transverse band-like scales. Upper parts uniform blackish brown; lower surface of shell uniform yellow; soft parts pale brown beneath.

Length of shell 39 centim.

Two specimens (females), collected in the Lobuk Antu district, Sarawak, by Mr. C. Hose, are now in the British Museum.

This new tortoise belongs to a very distinct type of freshwater Testudinidæ, combining characters of *Ocadia* and *Bellia*.

XLVIII.—On a new Nymphalid Butterfly from N.E. Borneo.

By ARTHUR G. BUTLER, Ph.D., F.L.S., F.Z.S., Senior Assistant-Keeper, Zoological Department, British Museum.

THE following species was collected and recently presented to the Museum by W. B. Pryer, Esq., of Sandakan. It is allied to *Zeuxidia amethystus* and *Z. victrix*, but differs considerably in the scaling and tufting of the secondaries. As a new genus is certain to be found sooner or later for this section of *Zeuxidia*, I may as well name it at once:—

Ann. & Mag. N. Hist. Ser. 6. Vol. xix.

33

ZEUXALTIS, subgenus novum.

Outline and neururation of *Zeuxidia*, but the secondaries thinly scaled and semitransparent, with the exception of a broad border encircling the wing and an arched series of six broad internervular elongated patches crossing the outer portion of the basal half from the costal vein across the discoidal cell to the submedian vein; the first three of these patches are much thickened and covered by broad flattened tufts of long hair.

Zeuxidia (Zeuxaltis) Pryeri, sp. n.

Primaries above nearly as in *Z. victrix*, but the apical area much wider between the blue arched belt and the outer margin, especially towards costa: the secondaries considerably paler owing to the thin scaling on these wings excepting in the borders and glandular patches; the first three of these pale in colouring, but almost concealed by blackish tufts of hair, the remaining three much more elongated and deep pitchy brown, the last (upon interno-median area) very much elongated; the costal, outer, and inner borders pitchy brown, the basal half of the submedian vein bearing a fringe of long hair; a very well-defined wavy blue submarginal band, partly concealing the brown outer border and emitting an oval elongated spot inwards upon the first median areole. The under surface resembles that of the allied species, which this insect corresponds with in expanse of wings.

♂. Sandakan, N.E. Borneo. Type coll. B. M.

The narrow wavy submarginal band of the secondaries and the different arrangement of tufts on the secondaries, as well as the curiously diaphanous character of these wings, due to the somewhat different structure of the scales, readily distinguish it from all the known forms of *Zeuxidia*, *Amathusia*, *Amathuzidia*, &c.

MISCELLANEOUS.

Astacus vindicated as the Lobster's Genus.

By the Rev. THOMAS R. R. STEBBING, M.A., F.R.S., F.L.S.

A CLEVER man invented a mechanical speaking figure, and subsequently, it is said, in a frenzy of disappointment at the results of his ingenuity, himself destroyed it. A similar course, apart from the frenzy, may be strongly recommended to Mr. Pocock for the treatment of his new principle in zoological nomenclature, "for selecting the type species of a genus when no type has been designated by the author." He says that it may be stated as follows:—

"When the name of a genus is the same as that of one of its component species, that species is the type of the genus."

Coupling this piece of legislation with the facts that Linnæus called the Swedish crayfish *Cancer astacus* and that this species was included with others by Gronovius and Fabricius in the genus *Astacus*, Mr. Pocock draws the conclusion that *Astacus astacus* (Linn.) is the proper designation of the Swedish crayfish, and that for the European crayfishes in general *Astacus*, and not *Potamobius*, is the right generic name.

In February last Professor Bell kindly directed my inexperienced attention to certain Rules and Recommendations put forth under the auspices of the British Association. On comparing these with the proposed improvement of them above quoted, one is forcibly reminded of Medea's advice to her cousins to restore their father's youth by cutting him up and boiling the pieces in a pot with other ingredients. The Stricklandian rule says, "A new specific name must be given to a species when its old name has been adopted for a genus which includes that species." The sensitive ears of Strickland's committee objected to such combinations as *Pyrrhocorax pyrrhocorax*. Later on a revising committee, with Sir W. Jardine as reporter, agreed that when a specific name has been unhappily adopted as generic, "it is the *generic name* which must be thrown aside, not the old specific name." Both of these rules must be set aside to justify the use of *Astacus astacus*. But another Stricklandian rule says, "When the evidence as to the original type of a genus is not perfectly clear and indisputable, then the person who first subdivides the genus may affix the original name to any portion of it at his discretion, and no later author has a right to transfer that name to any other part of the original genus." Now, my contention is that the synonymy in the 'Fauna Suecica' of Linnæus, 1746, clearly and indisputably shows that the common lobster had a prescriptive right to be regarded as the type of the genus *Astacus*. But if on technical grounds that evidence be disallowed, then it was Leach who first subdivided the genus, and who, at his discretion—surely his very sound discretion—affixed the original name to that portion of it containing the common lobster.

As to the general question whether such forms as "*Astacus astacus*" are in any case permissible, an answer may be humbly suggested. When they have been actually used as the first binary combination of names applied to a species, in the interests of priority it would be well to let them stand, unless they have some other weakness besides the tautophonical. But a rule for introducing them into parts of zoology where they have not previously been used or perhaps even thought of will not, one may trust, obtain any currency, even though proposed by so sound and sagacious a naturalist as my friend Mr. R. I. Pocock. To take a single example, the *Pagurus aniculus* of Fabricius was changed by Dana, in accordance with the Stricklandian rule valid at the time (1852), into *Aniculus typicus*, and this, on Mr. Pocock's principle, would, "*ipso facto*," as he says, become *Aniculus aniculus*, to which any moderately intelligent echo could only reply "ridiculous, ridiculous!" And if that and various other objectionable results of the new principle were accepted, it still would not follow that "*Astacus*

astacus (Linn.)" could be upheld. The instances are numerous in which authors, in subdividing a genus, have borrowed the name of one of its old species and bestowed it upon one of the new genera, and in these it is natural to suppose that the species which supplied the name was regarded as the type. In Dana's *Aniculus typicus* this view finds definite expression. To the *Homarus vulgaris* of Milne-Edwards it is an additional objection that that distinguished author adopts for the generic name of the lobster the specific name which Linnæus applied to the crawfish. This would not of itself in any way invalidate the term *Homarus*, but it may contribute to our satisfaction in finding it on other grounds untenable. Now, when we turn from these examples to regard the proposal to call the Swedish crayfish *Astacus astacus* (Linn.), it really looks as if Mr. Pocock thought that Gronovius and Fabricius had borrowed the generic name *Astacus* from the Linnean species *Cancer astacus*. Yet the third volume of Seba's 'Thesaurus' bears the very same date as the tenth edition of Linnæus's 'Systema,' and was probably in print before it, though perhaps not issued till later; and this volume of Seba contains many species of *Astacus*, but not the *Cancer astacus* of Linnæus. The zeal for giving paramount authority to that unlucky species is peculiarly misplaced: neither in the genus nor in the species has it any decent right to the title *Astacus*. As Mr. Walter Faxon showed in 1884, through more than three centuries of modern science its accepted specific name almost without interruption has been *fluviatilis*. The genus *Astacus*, in the wide and vague extension given to it by naturalists earlier than Leach, was well known long before Linnæus was born, and nothing could be much more absurd than to give him, of all men, special rights over it because both generically and specifically he misnamed the Swedish crayfish.

In opening this controversy Professor Bell accused me of "courage" for having, as he supposed, in my 'History of Crustacea' altered the Latin names of the common crayfish and the common lobster. In defending *Astacus gammarus* as the name of the European lobster and *Potamobius fluviatilis* as the name of one of the European crayfishes I have sheltered my timidity behind successive authorities of the British Museum itself. Professor Bell was writing apparently in the interests of conservatism, to defend accepted names against innovation. His colleague comes forward to help him, and devises a principle which would make the time-honoured *Maia squinado* and many other well-known names unstable, and would almost justify one in borrowing Professor Bell's indignant eloquence to declare that it "will throw into confusion not only carcinological literature, but every text-book in every language under the sun." This will it do without in any way touching the position of the "priority purists" or giving them that "short shrift" their censor has so long wished them. One is tempted to believe that when, on the Kalends of March, the two augurs met in the corridors of the Museum, instead of rushing into Mr. Pocock's arms in a transport of gratitude, the professor must have eyed him with a glance of scornful suspicion and exclaimed—

"Non tibi auxilio nec defensoribus istis."

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SIXTH SERIES.]

No. 113. MAY 1897.

XLIX.—*Notes on the Longicorn Genus Glenea, Newm., with Descriptions of New Species.* By O. J. GAHAN, M.A., of the British Museum (Natural History).

THROUGH the kindness of M. René Oberthür I have been enabled to compare the series of types belonging to the genus *Glenea* which are contained in his collection, with the types in the British Museum, now largely augmented by the addition of those contained in the collection of the late Mr. Pascoe. As a result I have prepared a list of synonyms, which will show that the suspicions entertained by M. Oberthür and myself as to the identity of many of the species described by Thomson and Pascoe are fully confirmed. The close examination of species necessary in making these comparisons has led to the observation of certain characters, previously overlooked, to which I call attention in the following notes. Descriptions of some new species are added, and a new genus is characterized for the reception of two species hitherto placed in *Glenea*.

1. *On the Structure of the Tarsal Claws in the Genus Glenea.*

In a note appended to his description of the genus *Glenea* Lacordaire* writes in reference to the tarsal claws:—"Je les ai examinés chez un grand nombre d'espèces et les ai trouvés

* 'Génère des Coléoptères,' tom. ix. p. 843 (3).

simples dans les deux sexes, avec un léger feston, souvent absent, à leur base. M. Pascoe cite cependant certaines espèces (*amboinica*, *cyanipennis*) chez les mâles desquelles ce feston se convertit en une dent aiguë." Here two conditions of the tarsal claws are indicated—first, in which the claws are simple in both sexes; second, in which the claws of the female are simple, while those of the male are toothed or appendiculate at the base. Each of these two conditions is met with in a large number of species; but I find that a different structure of the claws prevails in almost as great a number.

In *G. pulchella*, Thoms., the anterior claw of the anterior and middle tarsi of the male is furnished at the base, a little towards the outer side, with a distinct tooth, all the other claws being simple. This condition, which is similar to that met with in many species of *Saperda*, occurs also in many other species of *Glenea*—e. g., *nicanor*, Pasc., *Diana*, Th., *voluptuosa*, Th., *Thomsoni*, Pasc., and *giraffa*, Dalm. In another series of species the anterior claw of the middle tarsi only is provided with a tooth at the base; this is the condition met with in nearly all the large species of the *picta* group, and in a number of smaller species, such as *egeria*, Pasc., and *distinguenda*, Gahan. This tooth is strongly developed in some species; and in *G. chalybeata*, Th., and *regularis*, Newm., it is of so large a size that the anterior tarsus of the male appears to be furnished with three claws instead of two. Another condition of the claws appears in a few species, in which the anterior claw of the anterior tarsi only is furnished with a distinct tooth at the base; this condition is best shown in *G. galathea*, Th., where the tooth is so strongly developed that the tarsus appears to have three claws. *G. galathea*, it may be remarked, seems in other respects closely allied to *G. indiana*, Th., and *canidia*, Th., in both of which species all the claws of the male are simple.

A further condition of the claws is met with in *G. novemguttata*, Casteln., *albolineata*, Th., *cœruleata*, Pasc., *lugubris*, Th., and other species. Here the anterior claw of all the tarsi in the male is furnished with a tooth or appendix at the base, while the posterior claw is either simple or carries a smaller and less conspicuous tooth than the anterior claw.

So far as I have at present observed, the females of *Glenea*, except in four species hitherto placed in the genus, always possess simple claws. In two of those four species—viz., *G. tenuilineata*, Th., and *G. camolina*, Pasc.—all the claws in the female are appendiculate at the base. The remaining

two—viz., *G. nigromaculata*, Thoms., and *G. glechoma*, Paus.—are altogether exceptional in the character of their tarsal claws, and, moreover, differ from true species of *Glenea* in not having distinct lateral carinæ on the elytra: for the reception of these two species I have thought it desirable to found a new genus, *Heteroglenea*, which is further characterized below.

Leaving out of consideration the four species last mentioned, we may sum up our observations on the tarsal claws of *Glenea* as follows:—

In the female all the claws are simple. In the male either (1) all the claws are simple; (2) all the claws are appendiculate at the base; (3) the anterior claw of all the tarsi is appendiculate at the base; (4) the anterior claw of the anterior and middle tarsi is toothed at the base; (5) the anterior claw of the anterior tarsi only is toothed at the base; or (6) the anterior claw of the middle tarsi only is toothed at the base.

N.B.—The terms anterior and posterior as applied to the claws in this note and elsewhere in this paper refer to the position of the claws when the tarsus stands in a direction at right angles to the axis of the body. Inner and outer are the terms usually employed by entomologists, but seem to me objectionable, inasmuch as the inner claw of the front legs corresponds morphologically with the outer claw of the hind legs.

2. On Sexual Dimorphism in the Genus *Glenea*.

There is little or no difference in coloration between the sexes in the great majority of the species of *Glenea*, whatever difference of this kind there may be consisting chiefly of a greater depth or intensity of colour in the female. In certain species, however, the difference in colour or marking is so pronounced that in more than one instance the two sexes have been regarded as distinct species in spite of clear evidence in favour of the contrary view.

The most interesting and best marked examples of this sexual dimorphism are afforded by *Glenea fulvomaculata*, Thoms., and a few closely allied species. In the female of *fulvomaculata* the upperside of the body is of a deep dull black or dark brown colour, marked on the pronotum with three rather broad orange-tawny stripes, and on each elytron with two large and somewhat quadrate spots of the same colour—one spot placed in front of the middle and connected

at its outer side with a short tawny vitta, the other spot at the apex; the underside of the body is covered with a grey pubescence.

The male of *fulvomaculata* is almost entirely covered with grey pubescence, the underside being of an ashy-grey or nearly white colour, the upperside of a darker shade of grey. Wallace correctly indicated these dimorphic forms as sexes of the same species; he had in fact taken them *in coitu*. Pascoe, however, while calling attention to Wallace's indication of the true facts of the case, refused to consider the two forms as conspecific, and expressed his belief that a mistake had been made by the insects. I have carefully examined all Pascoe's specimens and all other specimens available, with the result that I could find no females among the grey forms, no males among the black forms with tawny spots and stripes; and I have further been led to the conclusion that Pascoe has mixed up under one name—*G. grisea*, Thoms.—male examples belonging to four closely related species or, as some might prefer to consider them, four clearly marked geographical races of one species, viz., *G. arouensis*, Thoms., *G. fulvomaculata*, Thoms., *G. papuensis*, Gahan (described below), and *G. grisea*, Thoms.

These four species are easily distinguished from one another by obvious differences in markings when the females alone are taken into consideration. The males, though so strikingly different from the females, are so much alike that it is not surprising to find that Pascoe placed them all in one species. Of the males which he thus included in *G. grisea*, Thoms., only those from Ceram and Amboina strictly belong to that species. (The females of this species have been described by Pascoe in his 'Longicornia Malayana' under the name of *Glenea interrupta*, Thoms. The species described by Thomson under the same name is, however, quite distinct, and, I believe, identical with the species subsequently described by him as *Glenea Boisduvali* *.) The males from Batchian are certainly males of *G. fulvomaculata*, Thoms., and those from the Aru Is. males of *G. arouensis*, Thoms.; while I consider a male from Salwatty, on account of its locality, to belong to the species or race which I have named *papuensis*. Though the males of these species are, as I have said, very much alike, slight

* The confusion of names indicated here seems to have arisen through the misplacement of a label. The specimen sent to me by M. Oberthür as the type of *G. interrupta*, Thoms., and labelled as such, belongs to the species described by Pascoe as *interrupta*, Thoms., while the locality, measurements, and description given by Thomson do not apply to it.

differences are observable in three of the species. The males of *G. grisea* are somewhat larger than the others, just as the females are also larger. In the males of *G. fulvomaculata* the deflexed sides of the elytra are not pubescent like the dorsal surface, but, being naked, lay bare the metallic-blue colour of the derm. This character, however, is uncertain, as it may possibly have been due to rubbing. In the males of *arouensis* the pronotum exhibits four faint black marks—two near the anterior border and two at the base—in positions exactly corresponding to those occupied by the distinct black marks on the pronotum of the females.

The next example of sexual dimorphism to which I wish to direct attention is furnished by *Glenea viridipustulata*, Thoms. The female is black, with two bands on the top of the head, three on the prothorax, the posterior half of the elytral suture, the apex, and five spots on each elytron, all of a bright silvery-green colour; and the tip of the third antennal joint is of a bluish-green colour. The male, described by Thomson as a distinct species under the name of *G. confusa*, Th., is scarcely to be distinguished from the male of *G. venusta*, Guér. It differs from the female of *viridipustulata* in having the antennæ entirely black, and the whole of the elytral suture bordered with green, while, instead of five spots on each elytron, there is a long dorso-lateral green vitta, and a short mid-dorsal vitta, near the end of which is placed a green spot. In the males the femora are as a rule yellowish testaceous in colour; but females also occur (these have been described by Thomson as a distinct species—*G. sparsa*, Th.) in which the femora are entirely testaceous.

The female of *G. venusta*, Guér., is described by Pascoe under the name of *G. viridinotata*, Blanch. It differs but slightly in markings from the male; the third antennal joint is circled with blue at the tip, and the green sutural vitta of the elytra does not extend to the base. Here again we seem to have as a result of evolution a clear differentiation in the markings of the females of two species, while the males have remained almost exactly alike. I must confess that in separating the males of the two species—*G. viridipustulata*, Thoms., and *G. venusta*, Guér.—I have been guided chiefly by the locality of the specimens, and not by any observed differences in their structure or marking. The specimens of the first species in the British Museum collection, including both males and females, are from the islands Batchian, Kaioa, Gilolo, and Morty; those of the second from the Aru and Ké Is., Dorey, Mysol, Waigiu, and Solomon Is.

A variety of *venusta*, Guér., differing slightly in the markings of the female, occurs in the island of Ternate.

From the fact that all the specimens of *G. obsoletopunctata*, Thoms. (= *ianthe*, Pasc.), in our collections are males and agree in localities with those of *G. anticepunctata*, Thoms., which are all females, I have been led to infer that those two series of specimens are merely sexes of one species. The females differ from the males in having a distinct tawny band along the vertex of the head and the middle of the pronotum. For similar reasons I conclude that *G. egeria*, Pasc., merely represents the male sex of *G. udetera*, Thoms., and suspect that *Glenea nympha*, Thoms., will prove to be the male of *Glenea juno*, Thoms.

3. New Species of *Glenea*.

Glenea zalinensis, sp. n.

Cæruleo-pubescent, nigro maculata et plagiata; prothorace supra maculis quatuor nigris—duabus ante medium, duabus ad basin—et lateraliter utrinque macula rotunda nigra; elytris modice elongatis, postice gradatim angustatis, apice truncatis et extus breviter spinosis, utrisque maculis vel plagis quatuor nigris transversis signatis—duabus inter medium basinque duabus inter medium apicemque; latere deflexo cæruleo, macula nigra prope basin signato; corpore subtus pedibusque cæruleis, pectore utrinque macula nigra et abdomine utrinque maculis nigris transversis in serie ordinatis, signatis; antennis nigris, articulis tribus basalibus cærulescentibus.

Long. 17, lat. 6 mm.

Hab. Zaline River, Tenasserim.

Type (♀) in British Museum collection. Presented by Col. Bingham.

This species seems most nearly allied to *Glenea celia*, Pasc., to which it has much resemblance in colour, though differing from the latter in having six black spots on the prothorax—four above and one on each side,—and in having the two posterior black spots of each elytron as large as the anterior spots (in *G. celia* they are smaller). It differs also from *G. celia* in being a relatively narrower insect, with the antennæ longer and more slender, reaching in the female to the apex of the elytra, whereas in the same sex of *G. celia* the antennæ only reach to about the beginning of the posterior fourth of the elytra.

Glenea aluensis, sp. n.

♂. Capitis fronte lateribusque et prothorace flavescenti-pubescentibus, hoc medio macula triangulari nigro-velutina, capite supra

viridi-cyaneo, fere glabro, in medio sat valde punctato; elytris cyaneo-violaceis sat valde denseque punctatis, griseo tenuissime pubescentibus, apicibus truncatis, extus breve dentatis; thorace subtus viridi-cyaneo cinereo-pubescente; abdomine chalybeato et testaceo; pedibus flavo-testaceis; articulo primo tarsorum anteriorum intermediorumque dilatato; unguiculis omnibus appendiculatis; antennis nigris.

♀. Prothoracis dorso antice plaga magna viridi-nigra marginem anticam attingente; elytris maculis sex albis in hexagona ordinatis; abdomine toto testaceo.

Long. ♂ 15, lat. $4\frac{1}{2}$ mm.

Long. ♀ 17, lat. 6 mm.

Hab. Alu Island, Solomon Archipelago (*C. M. Woodford*).

This species is closely allied to *G. cyaneipennis*, Thoms., and may possibly be only a local race of that species. The female very closely resembles the same sex of *cyaneipennis* and is marked with six white spots, arranged similarly in the form of a hexagon, on the anterior half of the elytra: but it wants the additional white spot behind the middle of each elytron which is present in the latter. In the male of *G. cyaneipennis* there are eight white spots on the elytra, arranged as in the female but less distinct, and exhibiting a tendency to merge into the faint grey pubescence which covers the elytra. In the male of the present form the elytra have a darker but fainter pubescence and show no trace of white spots.

Glenea subsimilis, sp. n.

Violacea, albo-maculata, pedibus testaceis.

Long. 19, lat. 5 mm.

Hab. India. One ♀ example in Brit. Mus. collection (ex coll. Pascoe).

♀. Head strongly punctured all over, but with the punctures less closely placed on the sides than on the front and vertex; without spots or bands of any kind. Thorax closely and strongly punctured, dark violet with black indumentum, with a white patch on each side just above the coxal cavity; disk in the middle with a short linear white spot in front and a triangular spot at the base. Scutellum blackish, with a white spot behind. Elytra strongly punctured: each with four white spots between the base and middle, a quadrangular spot placed near the suture just behind the middle, and a transverse white spot or fascia a little in front of the apex. Of the four anterior spots three are in the same line along the middle of the disk, the first being quite close to the

basal margin, the fourth is external to and scarcely posterior to the third. Apex of each elytron truncate in a slightly oblique direction, with a short tooth at the outer angle. Breast and abdomen violaceous, with white spots or bands. Legs testaceous. Antennæ bluish black at base, dark brown towards the apex.

In size and appearance this species resembles *G. Diana*, Thoms., but may be easily distinguished by the different arrangement of the white spots on the elytra.

Glenea propinqua, sp. n.

Supra atro-violacea; capite prothoraceque albo-vittatis; elytris albo-maculatis, pedibus nigris, griseo tenuissime pubescentibus. Long. 27, lat. $7\frac{1}{2}$ mm.

Hab. Singapore. One ♀ example in Brit. Mus. collection.

Head black, with a large spot on each cheek, a narrow band on each side of the front, two closely approximated vittæ above, and a small spot on each side behind the eye white. Prothorax with three longitudinal white bands above, and a broader white band on each side just above the coxal cavity. Scutellum with a white spot. Elytra closely and strongly punctured above in the anterior two thirds, less strongly or closely punctured on the deflexed sides; each marked with four white spots and, near the apex, with a curved white band and a lateral spot. First elytral spot elongated, placed a little behind the base; second and third spots in a line with the first, the second a little in front of the middle, the third just behind the middle; the fourth spot about halfway between the middle and apex, and placed close to the lateral carina; the posterior band begins near the suture in a slightly oblong spot, and thence curves backwards and outwards, ending at the lateral carina; but below its outer end there is, on the deflexed side, another white spot; the form of this band being very similar to that of the band occupying a corresponding position in *G. voluptuosa*, Thoms. Apices of elytra emarginate-truncate, distinctly toothed at both sutural and outer angles. Body underneath banded and spotted with white in a manner similar to *G. elegans*, *venus*, *voluptuosa*, &c. Legs and antennæ black, with faint greyish pubescence; posterior tarsi somewhat testaceous.

This species most resembles *G. voluptuosa*, Thoms., but is somewhat larger; the basal elytral spot is shorter and less linear, and between this spot and the posterior band there are three, instead of two, spots on each elytron; the head is

marked with two distinct white bands above and a small spot on each side; and the dorso-lateral vittæ of the prothorax are much more distinct and not interrupted in the middle.

Glenea siamensis, sp. n.

Nigra; capitis fronte utrinque albo-vittata; prothorace albo-pubescente, disco antice macula magna transversim ovali nigro-velutina, lateribus utraque macula parva rotunda nigra; scutello albo; elytris nigris, sutura, fascia transversa inter medium apicemque, et macula parva utrinque ad apicem, albescentibus; corpore subtus albo-pubescente, maculis ad latera meso-metathoracisque et abdominis nigris, segmento ultimo medio nigro, glabro; unguiculis omnibus tarsorum appendiculatis.

Long. ♂ $8\frac{1}{2}$, lat. $2\frac{1}{2}$ mm.

Long. ♀ 13, lat. 4 mm.

Hab. Siam.

Two examples (♂ and ♀) in British Museum collection. One (♀) in coll. Oberthür.

Head black, rather thickly punctured, marked with a whitish band on each side of the front. Prothorax yellowish white, with a large velvety-black spot, somewhat transversely oval in shape, on the anterior part of the disk and almost reaching to the anterior margin, and with a small round black spot on each side. Scutellum yellowish white. Elytra closely punctured, black, with the suture as far as the posterior band, this band itself, and a small spot at the apex of each elytron yellowish white. Body underneath with the pubescence along the middle rather faint and of a greyish colour, denser towards the sides and of a whitish colour, but interrupted by some black and nearly glabrous spots; last segment black, with a white spot on each side near the apex; legs black, with a faint grey pubescence. Antennæ black, longer than the body in both sexes. All the claws of the tarsi in the male furnished with a small tooth or appendix at the base.

Glenea albofasciata, sp. n.

♀. Atro-fusca; capitis fronte albo-bivittata; prothorace utrinque ad basin albo-fasciato, fasciis in medio basis pronoti angustim conjunctis; elytris fuscis, disco fasciis duabus albis sat latis—una basali, secunda paullo pone medium—et utrinque ad apicem macula alba; sterno medio griseo, lateraliter albo-plagiato; segmentis quatuor primis abdominis albo-fasciatis, quinto ad apicem albo-bimaculato; pedibus flavo-testaceis; antennis rufo-brunneis, gracilibus, quam corpore longioribus.

Long. 8-11, lat. $2\frac{1}{2}$ - $3\frac{1}{2}$ mm.

Hab. Java (*Horsfield*); Sumatra, Marang (*W. Doherty*).

Head dark brown, with cheeks and a vitta on each side of the front whitish. Prothorax dark brown, with a basal white band, which is tolerably broad on the sides, but is reduced to a very narrow basal border on the middle of the disk; fuscous areas of head and prothorax rather thickly and strongly punctured. Elytra dark brown, thickly and rather strongly punctured, with two yellowish-white bands across the disk (one basal, the other a little behind the middle), and a white spot on each side at the apex; apex of each elytron truncate, with a short acute tooth or spine at the suture, and a rather long sharp spine at the outer angle. Body underneath brown or brownish testaceous, with white bands on the sides of the thorax and first four abdominal segments; last segment dark brown, with a white spot on each side near the apical border. Legs yellowish testaceous. Antennæ reddish brown, longer than the body, by about two or three joints, in the female.

Glenea Wallacei, sp. n.

G. udetera (Thoms.) similis, sed differt prothorace lateraliter et corpore subtus omnino griseis.

Long. ♂ ♀ 11-13, lat. 3½-4 mm.

Hab. Sarawak (Wallace). Two examples (♂ and ♀) in Brit. Mus. collection.

Head grey-pubescent; the vertex marked with a tawny-yellow spot, which is narrower anteriorly where it fills the space between the upper lobes of the eyes, and wider posteriorly where it extends back to the anterior margin of the prothorax. Prothorax velvety black above, dark grey at the sides. Scutellum black, with hind margin yellowish tawny. Elytra with a transverse buff-yellow band across the disk of each, a little in front of the middle of its length, and with a much wider band of the same colour just before the apex; disk of elytra between these bands of a dark velvety-brown colour and exhibiting no punctures; disk, in front of the submedian band, testaceous, distinctly punctured, and covered with a faint greyish-tawny pubescence, the extreme base of the elytra, including the shoulders, of a dark brown colour; the deflexed sides of a brownish-testaceous colour, each marked with two rows of punctures; apex of each elytron furnished with a short spine at the suture and a longer spine at the outer angle. Body underneath with a greyish pubescence. Legs yellowish testaceous, with the tarsi of the two anterior pairs greyish pubescent over black on the upper surface. Antennæ brownish black, rather slender,

longer than the body in both sexes. Male with all the tarsal claws furnished with an angular tooth or appendix at the base.

This species is easily distinguished from *G. udetera*, Thoms., by the absence of white bands from the sides of the thorax and abdomen. In this respect it resembles *G. obsoletopunctata*, Thoms. (= *ianthe*, Pasc.), but is distinguished from the latter by the more extended testaceous area on the anterior half of the elytra, and the presence of a well-marked buff-yellow spot on the vertex of the head. In *G. anticepunctata*, Thoms., which I believe to be the female of the last-mentioned species, there is a buff-yellow band along the middle of the pronotum, which is continued on to the vertex of the head.

Glenea lineata, sp. n.

Nigro-fusca, cinereo-vittata; femoribus flavo-testaceis; capitis fronte lateribusque et vittis duabus verticis postice convergentibus; prothoracis vittis quinque; scutello elytrorumque sutura apice et vittis tribus utrinque (quarum duabus dorsalibus, tertia laterali) cinereis; corpore inferiore albo-cinerascente, pectore abdomineque medio nigro, subtiliter cinereo-pubescentibus, vitta pectoris utrinque nigra. (♂) Unguiculis anticis tarsorum anteriorum mediorumque basi valde dentatis.

Long. 9-11, lat. $2\frac{1}{2}$ - $3\frac{1}{2}$ mm.

Hab. Oshima, Loo-Choo Archipelago (*Ferrié*, 1895). In coll. Oberthür and in Brit. Mus.

Head with the sides, front, and two posteriorly converging bands on the vertex ashy grey; middle of the front with a fainter grey pubescence. Antennæ black. Prothorax with five ashy-grey bands, of which three are dorsal, the other two placed one on each side, and quite invisible when the thorax is viewed from above. Scutellum, suture, apex, and three bands (two dorsal and one lateral) on each elytron ashy grey; inner dorsal band reaching from the base to a little beyond the middle of the elytron, outer dorsal band reaching from the base to within a short distance of the transverse apical band; the lateral band reaching from a little behind the shoulder almost up to the apical band. Head and prothorax closely punctured, the elytra less closely but more strongly punctured, with the punctures most distinctly seen in the intervals between the grey bands; apex of each elytron emarginate-truncate, with tooth at suture and spine at the outer angle. Body underneath with a greyish-white pubescence, which is much less dense on the middle of the breast

and abdomen, while a short band on each side of the metasternum is almost entirely glabrous and black. Femora yellowish testaceous; tibiae and tarsi black, with a faint greyish pubescence. In the male the anterior claw of the anterior and middle tarsi has a well-developed tooth or appendix at the base, this tooth being larger and more distinct on the middle than on the anterior tarsi.

Glenea assimilis, sp. n.

♂. Capitis lateribus fronteque (hac supra in medio excepta) et vittis duabus verticis postice convergentibus, albescenti-pubescentibus; prothorace atro-velutino, supra vitta mediana et lateraliter utrinque vittis duabus antice et postice conjunctis, albis; scutello albo; elytris brunneo-testaceis, postice fuscis, utrisque maculis sex albis, quarum quatuor anticis haud distinctis, duabus posticis distinctis—una prope carinam lateralem pone medium posita, altera ad apicem; corpore subtus albescenti-pubescente; pedibus antennisque testaceis; unguiculo antico tarsorum anteriorum mediorumque basi dentatis.

Long. $9\frac{1}{2}$, lat. $2\frac{1}{2}$ millim.

Hab. Sylhet in Assam. British Museum collection.

Head and prothorax black; sides and front of the head and two posteriorly converging vittae on the vertex ashy white. Prothorax with a median dorsal white vitta, and two white vittae on each side, of which one runs alongside the coxa, the second being closely approximated to it and uniting with it at the front and hind border. Scutellum white. Elytra brownish testaceous in the anterior two thirds of their length, on which area each elytron is marked in the male type with four small and very indistinct white spots; three of these spots appear as if forming part of a broken mid-dorsal band, the hindmost of the three being placed at about the middle of the length of the elytron; the fourth lies external to the middle one of these three and is close to the lateral carina. The two spots on the posterior part of each elytron are very distinct; one is close to the lateral carina at the beginning of the posterior third, the other just in front of the apex, and the area between them is of a dark brown colour. Apex of elytron with distinct spine at the outer angle. Underside of body covered with an ashy white pubescence. Legs and antennae testaceous. Anterior claw of the anterior and middle tarsi toothed at the base, the other claws simple.

The characters given above apply to the male type. A female specimen from Mungphu in Sikkim probably belongs to the same species. Apart from the ordinary sexual differences, the only differences I find are as follows:—

Prothorax with only one white vitta—the lower or supra-coxal vitta—on each side. Each elytron with three instead of four small spots on the anterior half, the missing spot being the middle one of the three forming the inner or mid-dorsal row.

Glenea relicta, Pasc., closely resembles this species both in colour and markings, and is characterized by a somewhat similar difference in the markings of the two sexes, the male having two widely separated white bands on each side of the prothorax, while in the female there is on each side only one short vitta which borders the coxal cavity. The spots on the elytra are five in number on each elytron in both sexes and arranged as in the female of *G. assimilis*. The antennæ are dark brown, and the legs, except at the base of the femora, are dark brown, with a faint grey pubescence. All the tarsal claws of the male are toothed or appendiculate at the base.

Glenea gratiosa, sp. n.

♂. Capitis fronte genisque albescentibus, vertice nigro-fusco; prothorace sat dense punctato, supra nigro, vitta mediana alba, lateribus griseo-sericeis; scutello albo; elytris brunneis, utrisque maculis albis quinque notatis—tribus ante, duabus pone medium, 1°, 3° et 4° prope suturam, 2° et 5° prope carinam lateralem; apicibus truncatis griseo-limbatis, et extus spinosis; corpore subtus fusco, plagis albis ad latera meso-, metathoracis et segmenti tertii abdominis notato; pedibus antennisque testaceis; unguiculis omnibus tarsorum simplicibus.

Long. 10, lat. 3 mm.

Hab. Sylhet in Assam. British Museum collection.

Head dark brown, with the cheeks and front white. Prothorax more strongly and thickly punctured than the head, black above, with a narrow median white band; the sides appearing black in certain lights, but covered with a silky pubescence of a greyish colour, which becomes evident in reflected light. Scutellum white. Elytra brown, distinctly punctured, each with five white spots, of which three lie between the middle and base, two between the middle and apex; the second and fifth spots are placed near the lateral carina, the remaining three nearer the suture; apex of each elytron truncate, with a spine at the outer angle; in front of the apical border there is a transverse spot or band of a greyish colour. Body underneath dark brown, with a white patch on each side of the mesothorax, a larger oblique patch on each side of the metathorax, and a transverse patch on each side of the third abdominal segment. Legs and antennæ testaceous. Tarsal claws of the male all simple.

Glenea griseoguttata, sp. n.

G. lachrymosa (Pasc.) persimilis, sed differt fronte capitis latiore; elytris nigris haud chalybeatis, maculis elytrorum aliter ordinatis.
♂. Long. 9, lat. 3 mm.

Hab. Macassar (Wallace).

Head black, with the front, the cheeks, a border behind the eyes, and two parallel lines on the vertex ashy grey. Prothorax with two ashy-white bands (including the supra-coxal band) on each side and three grey bands on the disk. The two outer bands of the disk do not reach the base and are slightly constricted at about the middle of their length, so that each appears to be formed of two spots. Elytra black, with the base, the suture, the apical margin, and six spots on the disk of each grey; the third of these spots is largest and is placed at about the middle of the length of the elytron and close to the suture; the two spots in front of it lie obliquely, the first a little in advance of the second and nearer to the suture; the two spots next behind it—the fourth and fifth—are also placed obliquely, the fifth being close to the suture, the fourth near the lateral carina; the sixth spot is placed near the lateral carina, in a line with the second and fourth. Underside of body with an ashy white pubescence; legs testaceous, with a faint grey pubescence. Antennæ black.

Male with first joint of the anterior and middle tarsi slightly dilated; with all the claws of the tarsi simple.

Glenea papuensis, sp. n.

(♀) *G. fulvomaculata* (Thoms.) affinis et similis, sed differt vittis externis pronoti obsoletis.
Long. 10–11, lat. $3\frac{1}{2}$ –4 mm.

Hab. New Guinea, Dorey and Mysol (Wallace).

♀. Head black, punctured in front; vertex marked with a tawny ochraceous band. Pronotum black or dark brown, with a median tawny ochraceous band, which is continuous in front with the band on the vertex, and behind with an oblong spot on the scutellum; sides of prothorax grey. (A faint line is present in some specimens on each side of the pronotum in a position corresponding to that occupied by the external vitta in *G. fulvomaculata*.) Elytra metallic blue, but with this colour showing only on the deflexed sides, the dorsal surface being covered with a close-fitting dark brown tomentum, which is relieved by two tawny ochraceous spots on each elytron—one spot placed in front of the middle,

the other at the apex. Legs and underside of body with a light or dark brown derm, covered with a not very dense grey pubescence.

A male specimen from Salwatty may with some probability, on account of the locality, be referred to this species. It completely resembles the males of *G. fulvomaculata*, Th., which differ from those of *G. grisea*, Th., only by their somewhat smaller size and in having the deflexed sides of the elytra glabrous.

Glenea caelestina, sp. n.

G. laudata (Pasc.) sat similis, sed differt vitta laterali prothoracis ab vitta mediana minus distante, et antice interrupta, margine basali prothoracis tota et margine anteriore ad latera cœruleo-limbata, sutura elytrorum ex parte cœrulea, antennis omnino nigris.

Long. 9-11, lat. $2\frac{1}{2}$ - $3\frac{1}{2}$ mm.

Hab. Java.

Head black, with the cheeks, the basal margin, and a vitta on each side of the front and two short closely approximated vittæ on the vertex between the eyes pale blue. Prothorax black, with three pale blue bands—one median, continued along the whole length of the pronotum, and one towards each side extending from the base to the middle; the anterior margin on each side from the sternum to a point opposite the extremity of the short dorso-lateral vitta bordered with blue; basal margin also bordered with a blue band, which is continued along the side of the prothorax, just above the coxal cavity, to join the anterior border. Scutellum blue. Elytra black; the disk of each with five blue spots—two placed obliquely between the base and the middle, the outer spot being a little in advance of the inner one, the third spot almost at the middle of the elytron, the fourth midway between this and the fifth, which lies just in front of the apex. Underside of the body dark brown banded with blue. Femora testaceous; tibiæ and tarsi brown, with a faint bluish-grey pubescence. Antennæ entirely black. Male with all the tarsal claws appendiculate.

In the Catalogue of Gemm. and Harold this species (= *G. caelestina*, Chev. MS.) is placed as a synonym of *G. laudata*, Pasc. (= *viridinotata*, Thoms., nec Blanch.), but it is in reality very distinct, as the characters given above will show. The locality of the second species is Borneo, as given by both Pascoe and Thomson, and not Java, which is the locality erroneously placed opposite *G. viridinotata*, Thoms., in the Catalogue.

Glenea suturalis, sp. n.

G. blandina (Pasc.) affinis et similis, sed differt vitta suturali elytrorum latiore et in colore fulvescentiore, maculis duabus auticis utriusque elytri obliquiter (non transversim) positis.

Long. (♂) $9\frac{1}{2}$, lat. $2\frac{1}{2}$ mm.

Hab. Penang (*Lamb*).

A male specimen of this species was noticed by Pascoe, who considered it to be, and described it as, a male of *G. blandina*, Pasc.; but I have found two female examples amongst his collections, and have seen a third, belonging to M. Oberthür, which agree with the male in those points in which it differs from the type of *G. blandina*. These points are:—(1) the sutural vitta of the elytra is much broader and is of a distinctly tawny brown colour instead of being grey; (2) the two anterior spots of each elytron are not placed side by side in a transverse direction, but one (the inner) lies a little in advance of the other; (3) the middle of the basal margin of each elytron is touched with blue, and there is a blue spot on each side just under the shoulder.

The four specimens of *G. suturalis* which I have seen are from Penang. In the male all the claws are simple.

The type of *G. blandina*, Pasc., and a second specimen which I have seen in M. Oberthür's collection, both females, are from Borneo.

Glenea chlorospila, sp. n.

Nigra; vittis duabus approximatis capitis vertice, vitta media et vitta laterali utrinque prothoracis, scutello, sutura et maculis septem utroque elytro argenteo-viridibus; capitis fronte lateribusque et corpore subtus viridescentibus; femoribus tibiisque subtiliter, et tarsis supra densius viridi-pubescentibus.

♂. Oculis majoribus, capitis fronte angustiore; unguiculis omnibus tarsorum basi dentatis, sed dente unguiculi antici tarsis anterioribus mediisque plus conspicuo.

Long. $9\frac{1}{2}$ –13, lat. $2\frac{1}{4}$ –4 mm.

Hab. Oshima, Loo-Choo Archipelago (*Ferrié*, 1895). In coll. Oberthür and in Brit. Mus.

Black, with silvery green spots and bands. Head closely punctured, with the cheeks, the base and sides of the front, and two closely approximated bands on the vertex (in some cases almost forming a single band) silvery green; middle of the front with a fainter greenish-grey pubescence. Antennae black; a little longer than the body in both sexes. Prothorax closely and distinctly punctured, with a median dorsal

band and a band on each side (just visible from above) silvery green; lower part of sides also green. Scutellum green. Elytra with a narrow sutural band and seven spots on each silvery green; first spot (the smallest) placed at the extreme base not far from the scutellum; the third and fifth spots almost in a direct line with the first; while the second, fourth, and sixth are in line close to the lateral carina, the seventh spot is at the apex, and on its inner side touches the sutural band; the third, fourth, and fifth spots on each elytron occupy the angles of a nearly regular hexagon, whose posterior side would run transversely almost midway between the scutellum and the apex of the elytra; the elytra are rather strongly punctured, and, in addition to the lateral carina, a raised line runs along each side from a little behind the shoulder up to the outer apical angle; the apex is obliquely truncate, with a sharp angle or tooth at the suture and a short spine at the outer angle. In the male the claws of the tarsi are appendiculate, with the tooth or appendix of the anterior claw more strongly developed in the anterior and middle legs; the first joint of the anterior and middle tarsi is slightly dilated and a little longer than the two succeeding joints taken together; first joint of posterior tarsus a little longer than the three succeeding joints taken together.

Glenea signatifrons (Chevr. MS.), sp. n.

Nigro-fusca; elytris a basi usque ad medium rufo-brunneis, deinde ad apicem infuscatiss; capitis fronte vitta alba utrinque, vertice inter oculos maculis duabus albis, prothorace supra vitta media et utrinque vittis duabus (quarum una supracoxali) albescentibus; scutello albo; elytris utrisque maculis tribus et linea indistincta albescentibus—macula prima pone medium prope suturam, secunda inter medium apicemque carinam lateralem fere attingente, tertia maxima fere ad apicem; linea in depressione inter discum et carinam lateralem; corpore subtus cinereo, albo et nigro variegato; pedibus rufo-testaceis; antennis nigris, articulis 7^o 8^oque albescentibus.

Long. 7-10, lat. 2½-3½ mm.

Hab. Java (*Horsfield*); Sumatra, Si Rambé (*Modigliani*); Marang (*Doherty*).

Head dark brown, with the cheeks, two narrow and widely separated vittae on the front, and two linear spots on the vertex whitish. Prothorax dark brown, with a median dorsal and two lateral white vittae, the lower lateral vitta being somewhat broader than the other and placed immediately above the coxal cavity. Scutellum white. Elytra

reddish brown from the base to a little beyond the middle, and thence to the apex dark brown; each marked with three white spots on the posterior half—the first spot close to the suture, the second almost touching the lateral carina, and the third (which is the largest) placed very close to the apical border; a faint white line, placed just above the lateral carina, is to be seen on each elytron running from near the base to a short distance beyond the middle. Antennæ slender, longer than the body in both sexes, black in colour, with the seventh and eighth joints covered with white pubescence.

HETEROGLENEA, gen. nov.

Allied to the genus *Glenea*, Newm., with which it has many characters in common, but differing as follows:—Anterior claw of all the tarsi in both sexes bifid, posterior claw simple. Elytra without distinct lateral carinæ, but furnished instead on each side with an obtuse costa which reaches neither the base nor the apex. This genus will include the following two species, of which the first is to be considered the type.

1. *Heteroglenea nigromaculata*, Thoms.

Glenea nigromaculata, Thoms. Systema Cerambycidarum, App. p. 566.
Glenea ? *amelia*, Gahan, Trans. Ent. Soc. 1889, p. 224.

Hab. Siam and Burma.

Thomson's description of this species is very brief, consisting of two lines of Latin. I have fully described the male sex in the place cited above, and a further reference to the species, giving the synonymy and sexual differences, will be found in the Ann. Mus. Civ. Genova, vol. xxxiv. p. 89. Both in this species and the next the elytra are more parallel-sided than is usual in the genus *Glenea*, and, though truncate at the apex, are not spined.

2. *Heteroglenea glechoma*, Pasc.

Glenea glechoma, Pasc. Longicornia Malayana, p. 409.

† (*Glenea fuscovirgata*, Fairm. Ann. Soc. Ent. Belg. xxvii. p. 53.—New Britain.)

Hab. Matabello (*Wallace*); Sumatra (*Modigliani*); Solomon Islands (*Woodford*); Philippine Islands (*Semper*).

The division of the anterior claw of the tarsi is less evident in this species than in the preceding one and might very easily be overlooked; this claw, when looked at from the

side, is seen to be thicker than the posterior claw and cleft at the apex, with the outer division rather shorter than the inner. In Fairmaire's description the claws are said to be simple—"unguibus simplicibus"; and I am therefore obliged to doubt the correctness of the synonymy given above, though his description, which is pretty full, applies in all other respects to the present species.

4. *Synonymic Notes.*

1. *G. acuta*, Fabr.
= *lineosa*, Guér. in Bélanger, Voy. aux Indes or. p. 489, pl. ii. fig. 8.
2. *G. adelpha*, Thoms.
= *occidentalis*, Jord. Nov. Zool. i. p. 251.
3. *G. albolineata*, Thoms. (type ♀).
= *subfasciata*, Thoms. (type ♂), = *psylla*, Thoms.
4. *G. anticepunctata*, Thoms. (type ♀).
= *obsoletopunctata*, Thoms. (type ♂), = *ianthe*, Pasc.
5. *G. basalis*, Thoms. — *Hab.* Celebes — Macassar and Menado.
= *concinata*, Pasc. (partim), Waterh. Aid, vol. ii. pl. cxxx. fig. 5.
6. *G. discoidalis*, Pasc. (type ♂).
= *simplex*, Thoms. (type ♂), Rev. Mag. de Zool. 1879, p. 20.
(?) = *alysson*, Pasc. (type ♀).
7. *G. elate*, Pasc.
= *brunnea*, Thoms. Rev. Mag. de Zool. 1879, p. 17.
8. *G. exulta*, Newm. — *Hab.* Philippine Islands.
= *coryphæa*, Thoms.
9. *G. extensa*, Pasc. (type ♀), Waterh. Aid, vol. ii. pl. cxxx. fig. 8.
= *mima*, Thoms. (type ♂), = *jubæa*, Pasc.
10. *G. fatalis*, Pasc.
= *biapiculis*, Thoms. Rev. Mag. de Zool. 1879, p. 11.
11. *G. Fortunei*, Saund.
= *chloromelas*, Thoms. l. c. p. 21.

12. *G. gabonica*, Thoms.
= *cana*, Jord. Nov. Zool. i. p. 252.
13. *G. grisea*, Thoms. (type ♂).—*Hab.* Ceram and Amboina.
= *interrupta*, Pasc. (type ♀), Trans. Ent. Soc. (8) iii. p. 897.
14. *G. heptagona*, Thoms. (type ♀).
= *cyrilla*, Pasc. (type ♂).
15. *G. illuminata*, Thoms. (type ♀).
= *irene*, Pasc. (type ♂).
16. *G. interrupta*, Thoms. (nec Pasc., *loc. supra cit.*).—*Hab.*
Batchian, Borneo, and Singapore.
= *Boisduvalii*, Thoms.
17. *G. lugubris*, Thoms. (type ♂).
= *attalea*, Pasc. (type ♀), = *paleographa*, Thoms. Rev. Mag. de
Zool. 1879, p. 13.
18. *G. melissa*, Pasc.
= *manueta*, Pasc.
19. *G. miniacea*, Pasc.
= *Danae*, Gestro, Ann. Mus. Civ. Genov. vii. p. 1022.
20. *G. multiguttata*, Guér. (type ♀).
= *maculifera*, Thoms. (type ♂).
21. *G. myrrhis*, Pasc.
= *alcyone*, Thoms. Rev. Mag. de Zool. 1879, p. 14.
22. *G. myrsia*, Pasc. (type ♂).
= *corypha*, Pasc. (type ♀), = *Donovani*, Thoms. MS.
23. *G. myrsine*, Pasc.
= *areca*, Pasc.
= *cryllis*, Thoms. Rev. Mag. de Zool. 1879, p. 17.
24. *G. nicanor*, Pasc. (type ♀).
= *maia*, Thoms. (type ♂), *l. c.* p. 9.
25. *G. ochracea*, Guér.
= *ana*, Thoms.
26. *G. quadrinotata*, Guér.
= *nigrolineata*, Gahan, Ann. Mus. Civ. Genov. xxxiv. p. 88.

27. *G. quatuordecimmaculata*, Hope, in Gray's Zool. Misc. (1831) p. 28; Gahan, Trans. Ent. Soc. 1889, p. 222.
= *argus*, Thoms.
28. *G. regina*, Thoms.
= *neanthes*, Pasc.
29. *G. regularis*, Newm.
= *Kruatzi*, Thoms.
30. *G. scapifera*, Pasc.
= *trincomalica*, Thoms. Rev. Mag. de Zool. 1879, p. 12.
31. *G. strigata*, Thoms.
= *accata*, Pasc.
32. *G. udetera*, Thoms. (type ♀).
= *egeria*, Pasc. (type ♂).
33. *G. venusta*, Guér. (type ♂).—*Hab.* Aru and Ké Islands, Dorey, Mysol, Waigiou, Solomon Islands, and Ternate.
= *concinata*, Pasc. (partim).
= *viridicincta*, Boisd.
= *viridinotata*, Blanch.
34. *G. viridipustulata*, Thoms. (type ♀).—*Hab.* Batchian, Kaioa, Gilolo, and Morty.
= *confusa*, Thoms. (type ♂).
= *sparsa*, Thoms. (type ♀).

G. palliata, Pasc., *G. sospita*, Pasc., and *G. eclectica*, Pasc., are best placed in the genus *Daphisia*, Pasc., the elytra in each of these species being wholly devoid of a lateral carina.

The localities given for the following two species in the Catalogue of Gemm. & Harold are incorrect :—

G. galathea, Thoms.—*Hab.* Sumatra and Malay Peninsula (not Japan).

G. colenda, Thoms.—*Hab.* Philippine Islands (not Japan).

G. rubricollis, Hope, has been received from Kurseong and Mungphu in Sikkim, so that this locality may be added to that given in the Catalogue.

L.—Notes on some S.-American Muridæ.

By OLDFIELD THOMAS.

I. On three new Species from the Lower Amazon.

THANKS to the kindness of Dr. E. A. Goeldi, of the Para Muscum, I have been entrusted with a small collection of Bats and Rodents collected along the Lower Amazon.

Among these there are specimens of the three following new species of Muridæ. The typical specimen of each of them has been presented by Dr. Goeldi to the British Museum.

Oryzomys Goeldi, sp. n.

Allied to *O. laticeps*, Lund, with some specimens of which it agrees closely in colour and proportions, but much smaller in actual size.

Fur rather short, close, and straight, 6 or 7 millim. long on the posterior back.

General colour dull brown, tinged with dark buff, which is clearer on the flanks. Belly greyish white, well defined, the bases of the hairs slaty grey, the tips white or buffy white. Ears of medium length, thinly haired, brown. Hands and feet dull whitish; the metapodials and digits alike. Tail rather longer than the head and body, slender, very thinly haired; pale brown above and below.

Skull very similar to that of *O. laticeps*, apart from its smaller size. Nasals evenly narrowing backwards. Interorbital region level transversely, its edges square but not ridged, although posteriorly ridges are traceable along the parietals to the outer corners of the interparietal. General profile of skull evenly curved, convex from tip of nasals to back of interparietals. Anterior palatine foramina about equal in length to the molar series. Posterior nares square, the pterygoids parallel.

Dimensions of the type (taken as a spirit-specimen before skinning):—

Head and body 96; tail 104; hind foot 26; ear 15.

Skull: basilar length 22.5; greatest breadth 14.5; nasals 11.8 × 3.5; interorbital breadth 5; interparietal 3.7 × 9.6; palate length from henselion 13; diastema 8; anterior palatine foramina 4.6; length of upper molar series 4.5.

Hab. Itaituba, Tapajoz, Lower Amazon.

Type. Female. B.M. No. 97. 4. 1. 1.

This interesting little species, which is evidently a local

dwarf representative of *O. laticeps*, I have named in honour of Dr. Goeldi, to whose exertions, both as collector and author, we owe much of our knowledge of the fauna of Brazil, and to whose generosity the British Museum has been frequently indebted.

Holochilus nanus, sp. n.

General characters and colour very much as in the large *H. vulpinus* and *sciureus*, but scarcely half the bulk of the latter, the smallest previously known species of the genus. Colour coarsely mixed black and rufous, darkest on the middle line, clearer rufous on the sides, becoming quite bright rufous along the edges of the belly. Belly whitish, strongly washed with rufous, but the under-fur slaty grey basally. Face blackish brown, rather darker than the back; cheeks mixed with rufous. Ears rather short, hairy, their inner surfaces mixed rufous and brown, their outer brown anteriorly, rufous posteriorly. Arms rufous, metacarpals brown, fingers whitish brown. Hind feet whitish brown; soles naked, strongly fringed with the bristles of the edge of the feet. Tail rather shorter than the head and body, uniformly well haired, dark brown above, scarcely or not lighter below.

Skull with the essential characters of that of *H. sciureus**, but much smaller, and with the interorbital region flatter and less compressed. Anterior edge of zygoma-root slightly concave, less so than in *H. vulpinus*. Supraorbital ridges less prominently marked than usual and not standing up vertically above the general level, very inconspicuous on the anterior, and not extending at all on to the posterior half of the parietals; the interorbital region anteriorly is as usual narrow and compressed, but posteriorly it broadens more than is usual in this group. Anterior palatine foramina narrow, ending just in front of m^1 . Molars as usual.

Dimensions of the type (measured as a spirit-specimen, before skinning):—

Head and body 122 millim.; tail 112; hind foot 82; ear 14.

Skull: basilar length 26.6; greatest breadth 19; nasals 12.5×3.8 ; interorbital breadth 4.6; interparietal 2.6×11 ; palate length from henselion 16.7; diastema 9.7; palatal foramina 6.7×2.3 ; length of upper molar series 6.5.

It is interesting to notice that while the external and cranial dimensions are much less than in *H. sciureus*, the length of the molar tooth series in the two species is almost identical.

* Figured by Winge under the name of *Sigmodon vulpinus*, E. Mus. Lundii, i. pt. lii. pl. ii. fig. 5 (1888).

Hab. Source, Island of Marajó, Mouth of the Amazon.

Type. B.M. 97. 4. 1. 2.

This little rat is interesting on account of its small size, for with the essential characteristics (and among other things the proportionally large feet) of the big rats of the genus *Holochilus*, it is no larger than middle-sized *Oryzomys*, such as *O. laticeps*.

In working out this species I find I have hitherto been wrong in uniting *Nectomys*, Peters * with *Holochilus*, and now think they should both stand as genera. Winge united *Holochilus* with *Sigmodon*, but among other things the larger and much more complicated posterior upper molars of *Holochilus* and the differences in the character of the feet will readily separate the two.

So far as is yet known, the genus *Holochilus* is confined to the eastern half of S. America, from Marajó, where the smallest species occurs, southwards to Bahia Blanca, where Darwin obtained the largest one, figured and described by Waterhouse † as *Mus braziliensis*, but which ought, I believe, to be distinguished from that animal, and might therefore bear the name of *H. Darwini*. On the Parana and Uruguay systems down to La Plata there occurs a white-bellied form to which one or both of the names *H. vulpinus*, Bts., and *H. canellinus*, Wagn., may apply. This is found at least as far inland as Goya, Corrientes, whence Mr. R. Perrens sent several examples. *H. sciureus*, Wagn., from the San Francisco R., is intermediate in size as in locality between these larger southern species and the little *H. nanus*. Two names, *H. brasiliensis*, Geoffr., and *H. leucogaster*, Brandt, I have not as yet been able to identify with certainty. Possibly both apply to the intermediate form I have provisionally called *H. sciureus*.

Akodon fuscinus, sp. n.

Nearly allied to *A. lasiurus*, Lund, but smaller, and with more of the general appearance of the species of the *olivaceus* group.

Fur straight and close, not woolly, some 10 millim. in length on the back. General colour coarsely lined black and dark yellowish, the resulting colour being a dark grizzled

* In founding *Nectomys* (Abh. Ak. Berl. 1860, p. 151), Peters incidentally speaks of "*Holochilomys* (*Holochilus*, Wagn. nec Brandt)"; but Wagner's *Holochilus*, Schr. Säug. Suppl. iii. p. 1848, is unquestionably identical with Brandt's, as the description of the teeth and the species included clearly prove.

† Zool. Voy. 'Beagle,' Mamm. p. 58, pl. xix. (1840).

brown. This colour extends over the whole of the head and upper surface. Belly paler, the tips of the hairs dirty buff. Ears short, blackish. Limbs dark coloured, hands and feet smoky grey above; claws rather long and slender. Tail about two thirds of the length of the head and body, well covered with hair; black above, pale greyish below, the two colours not sharply defined.

Skull almost precisely similar to that of *A. lasiurus*, as figured by Winge*, although smaller. Upper profile evenly convex. Nasals short and narrow. Interorbital region smooth, its edges with well-defined ridges, which, however, practically end where they meet the parietal bone. Interparietal small and narrow. Palatal foramina open, with rounded margins, extending back to the level of the antero-internal notch of m^1 . Proportions of teeth about as in *A. lasiurus*.

Dimensions of the type (measured in spirit before skinning):—

Head and body 98 millim., tail 64, hind foot 19, ear 13.

Skull: basilar length 22·6; greatest breadth 14·9; nasals $8·3 \times 3·1$; interorbital breadth 4·7; interparietal $2·3 \times 7$; palate length from hensenion 12·7; diastema 8·2; palatal foramina $6·1 \times 2·1$; length of upper molar series 4·5.

Hab. Source, Marajó Island.

Type. Male. B.M. No. 97. 4. 1. 3.

II. The Species of the Genus *Nectomys*.

Nectomys has a very different range to that of *Holochilus*; it extends northwards to Surinam on the east, and to Colombia, Ecuador, and Peru on the west, and on the other hand is only found southwards to Rio Grande do Sul, no species having been as yet recorded from Uruguay or the Pampas districts.

The best known species is *N. squamipes*, Bts. (incl. *aquaticus*, Lund), which seems to be spread over most of Brazil, and from which I cannot separate either Surinam or Rio Grande do Sul specimens. How far it ranges inland is doubtful, but it is possible that "*Hesperomys rattus*, Pelzeln" ‡, from Marabitanas, Upper Rio Negro (which, though the type is too young for certain determination, is clearly a *Nectomys*), may prove to belong to the common species. *N. squamipes* has

* Pl. ii. fig. 11.

† Imperfect anteriorly.

‡ Nat. Bras. Säug. ii., S.B. zool.-bot. Ges. Wien, xxxiii. Beiheft, p. 73 (1883).

six plantar pads, while, so far as I know, all the other species have only five.

In Trinidad there occurs *N. palmipes*, All. & Chapm., whose skull may be distinguished by the much more uniform breadth and more abrupt ending behind of the nasals.

Thirdly, of described species, there is *N. apicalis*, Peters*, described from Guayaquil, which has particularly long narrow nasals, tapering behind to a long drawn-out point. This species I have also recorded from Chirimoto and Amable Maria, Peru.

* Besides these three species, the Museum possesses specimens of three more, each representative of a distinct geographical district, and each distinguishable by cranial characters. No doubt all six species are very closely allied, but, so far as the material goes, the species seem to be quite constant in the characters used.

The first species is from the valley of the Cauca, and has elongate and broad nasals, straight supraorbital ridges, and a flattened frontal region. This is the largest species as yet known, and may be called *N. grandis*.

The second is from the Magdalena Valley, and may be called *N. magdaleneæ*. Its skull is much more rounded, both on forehead and brain-case, than usual, and contrasts in this respect with the other species, which are all flattened in the frontal region.

Lastly, there is a species, believed to be from Quito, which is distinguished from all the rest by its rich fulvous colour. In the skull it has a much flattened frontal region, of which the bounding ridges are straight and less divergent than usual. It may be called *Nectomys fulvinus*.

The following are the detailed descriptions of the three new species:—

Nectomys grandis, sp. n.

Size large. General colour coarsely mixed black and dull yellow, the resulting tone not unlike that of *N. squamipes*, although the mixture is rather coarser. Sides dull brownish yellow, gradually passing into the yellowish buff of the belly. Belly hairs slaty grey basally, as usual. Hands and feet dark brown, edged with closely-set whitish bristles; soles naked, scaly, with five pads, all rather larger than in *N. apicalis*, especially the large proximal one, which is both longer and broader than in the allied species. Tail long, coarsely scaled, uniformly blackish, the under surface with a few whitish hairs intermixed with the black.

* Abh. Ak. Berl. 1860, p. 152.

Skull large and heavily built. Nasals long, slightly constricted about the middle, evenly tapering backwards, neither so long nor so narrow as in *N. apicalis*. Frontal flattened; supraorbital edges evenly divergent, straight, not bowed until they have reached the parietals; fronto-parietal suture forming nearly a right angle at the centre, instead of being nearly transverse. Palatal foramina parallel-sided, not broader behind than in front. Posterior edge of palate square.

Dimensions of the type (an adult male measured in skin):—

Head and body (c.) 290; tail (c.) 270; hind foot (moistened) 56; length of last foot-pad 11.

Skull, see p. 500.

Hab. Concordia, Medellín, Colombia. Coll. J. K. Salmon.

Type. B.M. 73. 11. 5. 3.

Nectomys magdalenæ, sp. n.

External characters unknown.

Skull heavy, rounded, its upper profile evenly convex throughout, and the frontal and parietal regions markedly swollen; this uniform convexity gives the skull a very different appearance to the frontally flattened skulls of other species. Nasals fairly broad, slightly compressed about their middle, pointed behind, but not markedly produced backwards. Line of supraorbital ridges slightly curving as they diverge, the curve evenly continuous with that of the temporal ridges. Fronto-parietal suture almost directly transverse. Interparietal rather longer antero-posteriorly and narrower transversely than usual. Anterior palatine foramina well open, parallel-sided, rounded at their ends. Posterior palate with the lateral pits unusually large and deep; palatal margin square.

Dimensions, see p. 500.

Hab. W. Cundinamarca, in lowlands near Magdalena R.

Type. B.M. 97. 3. 17. 1.

Nectomys fulvinus, sp. n.

Fur unusually short, the hairs only about 10–11 millim. in length on the back. General colour fulvous, lined with brown on the middle of the back, rather clearer on sides, and continued into the paler fulvous of the belly. Wool-hairs short and close, slaty gray basally, their tips fulvous above, buffy or whitish below. Hands and feet thinly haired, pale brown. Tail-hairs uniformly brown.

Nasals long, contracted at half their length, less attenuated and drawn out than in *N. apicalis*. Interorbital region flat,

narrow, its lateral ridges less strongly divergent than usual, and running quite straight to the point on the parietals at which they attain their greatest distance apart. Palatal foramina slightly broader behind than in front. Posterior palatal margin square, not V-shaped.

Dimensions of the type (an adult male skin):—

Head and body 231; tail 207; hind foot (moistened) 48.

Skull, see below.

Hab. Believed to be Quito. The specimen came from the collection of the late Sir W. Jardine, for whom a large number of skins were collected at Quito by Mr. Jameson. Sir W. Jardine also had a few specimens from Cayenne; but as we have already seen that the Surinam *Nectomys* appears referable to *N. squamipes*, the Quito locality is no doubt that of the present very different animal.

Type. B.M. 86. 7. 2. 7.

This species is readily distinguishable from all others by its deep fulvous colour, which more resembles that of some of the *Couesi* group of *Oryzomys* than that of the other members of the present sombre-coloured group.

Skull dimensions of *Nectomys*:—

	<i>N. grandis.</i>	<i>N. magdalena.</i>	<i>N. fulvinus.</i>
Basilar length .....	.....	36·5	.....
Lambda to nasal tip	42·2	39·7	41
Greatest breadth	26	25	26
Nasals, length	19·8	18·2	18
" breadth anteriorly ..	5·1	5	5·2
" greatest breadth behind the constriction	4·2	3·7	4
Interorbital breadth	7·2	7·8	7·1
Greatest distance between temporal ridges	12·8	14·5	12·8
Length of frontal suture ...	15·1	13·9	14·8
" parietal suture ..	8·2	8·2	8·8
Interparietal length .....	.....	5·6	.....
" breadth	9	11·5	.....
Palate length from hensenion	22·4	20·8	21·8
Diastema	13·2	12·5	13·2
Palatine foramina, length ..	7·3	7·4	7·5
" " breadth ..	8·1	3·4	3·2
Length of upper molar series	7·6	7·1	7·1

III. A peculiar Genus for "*Oryzomys*" instans.

Further consideration has convinced me that the curious little mouse I described * from Bogota under the provisional name of *Oryzomys instans* should certainly be distinguished

* Ann. Mag. Nat. Hist. (6) xvi. p. 368 (1895).

as a special genus, for which the name of *Chilomys* may be suggested.

No member of *Oryzomys* shows any tendency towards its peculiar cranial and dental characteristics, already described, and it seems therefore best to form a special genus for its reception.

LI.—*Descriptions of Five new Species of Mylabrinæ (Lyttidæ) in the Collection of the British Museum.* By Mrs. M. K. THOMAS.

Lydoceras bilineatus, sp. n.

Black, glabrous, shining, clothed on the underside with rather fine black hairs; the *head*, *prothorax*, and *elytra* are thickly and coarsely punctured. The *elytra* are black, each having two narrow transverse yellow bands bordered with red, of which the first across the middle of the elytron is margined posteriorly with red, and the second between the middle and the apex is margined anteriorly with red.

Antennæ black, short, and rather thick, and the *legs* also black, the femora clothed with very short yellow pubescence, and the tibiæ and tarsi with long black hairs; the claws are red.

This fine species differs from *Lydoceras fasciata*, the only previously known species of the genus, in the head and prothorax being more rugose, in having no red spots on the prothorax, in the antennæ being shorter, thicker, and more serrated, and in general form being longer and narrower.

Length 40, breadth 12 millim.

Hab. Athi Plains, British East Africa.

Collected and presented by Dr. J. W. Gregory.

Ceroctis vespina, sp. n.

Black, glabrous, sparsely clothed with longish black hairs; the *head*, *prothorax*, and *elytra* closely and somewhat coarsely punctured. *Elytra* bright yellow, with three transverse black sinuated bands on each elytron—the first one, between the base and middle, is narrower than the other two, and is composed of two spots either separated or joined into one band, which does not reach either the suture or the outer margin; the second, at the middle, is slightly broader, and touches the sutural and outer margins, as does also the third,

which is still broader and placed midway between the centre and apex.

The *antennæ* are entirely black, also the *underside* and *legs*, which are shining, with longish black hairs; the inside of the tibia and femora are clothed with pale yellowish short pubescence.

Length 15, breadth 7 millim.

Hab. Kambole, E. Africa.

Collected and presented by W. H. Nutt, Esq.

This species somewhat resembles in marking and colouring *Ceroctis Yerburyi*, Gahan; but the bands are more sinuated than those of the latter and the colouring not quite so vivid.

Ceroctis vellerosa, sp. n.

Black, densely and entirely covered with a thick yellow pubescence, which is longer and more strongly marked on the *underside*. The puncturing of the *head* and *prothorax* not visible, owing to the dense yellow pubescence, which is interspersed with long black hairs.

The *elytra*, which are closely and finely punctured, may be said to be either black, with deep yellow markings, or, on the other hand, yellow, with black markings. Considering the *elytra* to be black, the yellow markings are, firstly, on the basal half of the *elytron*, a long oval ring with a black spot in its centre, suturally, outside which there is a straight yellow line starting from the shoulder; on the posterior half of the *elytron* there are two triangular yellow markings opposite each other anteriorly and a yellow spot near the apex.

Antennæ black, with the usual characteristics of *Ceroctis*. The *underside*, *legs*, and *tarsi* all black and clothed with yellow pubescence.

Length 15, breadth 6 millim.

Hab. Fwambo, British East Africa.

Collected and presented by A. Carson, Esq.

Ceroctis rufimembra, sp. n.

Black, covered with short yellow pubescence, much thicker and longer on the underside. *Head*, *prothorax*, and *elytra* finely and closely punctured. *Elytra* black, somewhat opaque, each *elytron* with a long narrow band of yellow extending the whole length of the outer margin, widening at intervals, and continued as a narrow transverse apical band; nearer the suture four small oval yellow spots—the first on the shoulder midway between the outer margin and suture, the second just beneath the first, but almost touching the suture,

the third in middle of elytron and oblique, and the fourth transverse, just below the third and close to the suture.

Antennæ red, as are also the mouth-pieces.

Legs also entirely red, covered with yellow hairs, but interspersed with black at the tarsi.

Length 11, breadth 5 millim.

Hab. British East Africa.

Collected and presented by Dr. J. W. Gregory.

Decatoma regis, sp. n.

Black, opaque, glabrous, covered thinly with short yellow hairs interspersed with longer black ones.

Head, *prothorax*, and *elytra* finely and closely punctured, the head and prothorax more pubescent than the elytra; the latter black, each with eight small orange spots, placed—three on the shoulder in the form of a triangle, three on the middle, and two rather larger ones between the middle and apex.

Antennæ very dark red-brown, almost black.

Legs black, claws and spurs red.

Length 12, breadth $5\frac{1}{2}$ millim.

Hab. Angola.

Collected by Dr. Welwitsch; presented by the King of Portugal.

LII.—*A List of the Reptiles and Batrachians collected by Mr. Alfred Everett in Lombok, Flores, Sumba, and Savu, with Descriptions of new Species.* By G. A. BOULENGER, F.R.S.

REPTILIA.

1. *Hemidactylus frenatus*, D. & B.

Lombok, Sumba, Savu.

2. *Hemidactylus platyurus*, Schneid.

Savu.

3. *Gehyra mutilata*, Wieg.

Sumba.

4. *Gecko verticillatus*, Laur.

Lombok, Savu.

5. *Draco reticulatus*, Gthr.

Lombok, Flores, Sumba.

Originally described from the Philippines, this species has since been found in the Sanghir Islands by Bruijn, in Celebes by the Sarasins, and in Flores by Max Weber.

6. *Varanus salvator*, Laur.

Lombok, Flores, Sumba.

7. *Varanus timorensis*, Gray.

Savu.

8. *Mabuia multifasciata*, Kuhl.

Lombok.

9. *Lygosoma striolatum*, M. Web.

Flores.

10. *Lygosoma florense*, M. Web.

Flores.

11. *Lygosoma Everetti*, sp. n.

Section *Hinulia*. Body elongate, limbs rather short; the distance between the end of the snout and the fore limb is contained once and three fourths to twice in the distance between axilla and groin. Snout short, obtuse. Lower eyelid scaly. Nostril pierced in a single nasal; no supranasal; frontonasal broader than long, forming a suture with the rostral and with the frontal; latter shield a little shorter than frontoparietals and interparietal together, in contact with the two anterior supraoculars; four supraoculars; seven supraciliaries; frontoparietals and interparietal distinct, subequal; parietals forming a suture behind the interparietal; one pair of nuchals; fifth upper labial below the eye. Ear-opening oval, smaller than the eye-opening; no auricular lobules. 26 smooth scales round the body, dorsals largest; vertebral series not enlarged. A pair of large præanals. The adpressed limbs fail to meet. Digits short, feebly compressed; 18 to 20 smooth lamellæ under the fourth toe. Tail thick. Brown above, more or less spotted or freckled with black; a black lateral stripe, with a more or less distinct light edge above, dotted with white on the sides of the body, extending to the snout and passing through the eye; flanks speckled with black; lips with black vertical lines corresponding to the shields; lower parts white.

	millim.
Total length	120
Head	9
Width of head	6
Body	41
Fore limb	9
Hind limb	14
Tail	70

This species is nearest allied to *L. elegantulum*, Peters & Doria, from New Guinea and North Australia, and *L. brevipes*, Boettger, from Halmaheira. The latter species has been erroneously referred to the section *Homolepida* by its describer.

Sumba. Three specimens.

12. *Lygosoma smaragdinum*, Less.

Lombok, Sumba, Savu.

13. *Ablepharus Boutonii*, var. *quinquetæniatus*, Gthr.

Sumba. A single specimen with 24 scales round the body.

The type specimens of *A. quinquetæniatus* are stated to be from the West Coast of Africa.

14. *Dibamus novæ-guineæ*, D. & B.

Lombok.

15. *Typhlops florensis*, sp. n.

Snout prominent, rounded; nostrils inferior. Rostral about one fourth the width of the head, not extending to the level of the eyes, the portion visible from below half as broad as long; nasal incompletely divided, the cleft extending from the second labial to the upper surface of the snout; præocular present, narrower than the nasal or the ocular, in contact with the second and third labials; eyes distinguishable; præ-frontal, supraoculars, and parietals enlarged; four upper labials. Diameter of body 42 times in the total length; tail twice as long as broad, ending in a spine. 22 scales round the body. Olive-grey above, whitish beneath.

Total length 255 millim.

This species is very closely allied to *T. torresianus*, Blgr., from Murray Island, Torres Straits; it differs in the nasal cleft not being produced so far back on the top of the head, in the narrower rostral, and in the longer tail.

Flores. A single specimen.

16. *Liasis Mackloti*, D. & B.

Savu.

Previously known from Timor and Samoa.

17. *Python reticulatus*, Schneid.

Flores.

18. *Cylindrophis opisthorhodus*, sp. n.

Diameter of eye about one third its distance from the nostril; the distance between the eyes greater than the length of the snout. Nasals forming a suture behind the rostral; frontal as large as the supraoculars, slightly larger than the parietals, as long as its distance from the rostral; six upper labials, third and fourth entering the eye. Scales in 23 rows. Ventrals but slightly larger than the adjacent scales, 184-187; anal divided; subcaudals 6-7. Pale brown or buff above, with small black spots irregularly disposed; head yellowish, much spotted with black; white beneath, with continuous or broken and alternating black cross-bars, which are connected on the sides by a black uninterrupted stripe running from behind the head to the base of the tail; a much interrupted black stripe along the middle of the belly; anal region black; lower surface of tail bright pink.

Total length 230 millim.

Lombok. Two specimens, obtained at an altitude of 1500 feet.

19. *Polyodontophis geminatus*, Boie.

Lombok. Two specimens, belonging to the typical form, as known from Java.

20. *Lycodon aulicus*, Boie.

Sumba, Savu.

21. *Lycodon subcinctus*, Boie.

Lombok.

22. *Coluber subradiatus*, Schleg.

Flores, Sumba.

The specimen from Flores is typical, whilst that from Sumba is of a uniform blackish brown above and beneath, and has, on the right side, the subocular fused with the fourth labial, so that three labials enter the eye, as in *C. enganensis*, Vincig.

23. *Dendrophis pictus*, Gm.

Lombok, Flores.

24. *Dendrelaphis inornatus*, sp. n.

Maxillary teeth 20-22. Eye as long as or a little shorter than its distance from the nostril. Rostral once and two thirds as broad as deep, just visible from above; internasals as long as the prefrontals; frontal once and a half as long as broad, as long as its distance from the end of the snout, a little shorter than the parietals; loreal elongate; one pre- and two postoculars; temporals 2+2; nine or ten upper labials, fifth and sixth, or fourth, fifth, and sixth, entering the eye; five lower labials in contact with the anterior chin-shields, which are much shorter than the posterior. Scales in 15 rows, vertebrals moderately enlarged. Ventrals 191-199; anal divided; subcaudals 132-138. Pale olive-brown above, some of the scales with whitish outer edge; a black streak on each side of the head, passing through the eye; upper lip and preocular yellow; outer row of scales and sides of belly pale olive or greyish; ventrals and subcaudals between the keels greenish grey or bright yellow.

Total length 1200 millim.; tail 380.

Sumba and Savu. Several specimens.

25. *Cerberus rhynchops*, Schneid.

Flores, Sumba.

26. *Psammodynastes pulverulentus*, Boie.

Lombok, Flores.

27. *Dryophis prasinus*, Boie.

Lombok.

28. *Naia tripudians*, Merr.

Flores. A single young specimen, uniform olive-brown above, white beneath. 21 scales across the neck, 19 across the middle of the body.

29. *Lachesis gramineus*, Shaw.

Lombok, Flores, Sumba.

BATRACHIA.

1. *Oxyglossus laevis*, Gthr.

Flores.

2. *Rana macrodon*, Kuhl.

Lombok, Flores.

3. *Rana microdisca*, Bttgr.

Flores. Known from Java, Mentawi, and Celebes.

4. *Rana tigrina*, Daud.

Lombok, Sumba.

5. *Rana limnocharis*, Boie.

Lombok.

6. *Rana florensis*, sp. n.

Vomerine teeth in two oblique groups between the choanæ. Head depressed, as long as broad or a little longer than broad; snout moderately prominent, truncated, as long as the diameter of the orbit; canthus rostralis sharp; loreal region nearly vertical, grooved; nostril nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum very distinct, as large as the eye or a little smaller. Fingers moderate, first extending beyond second; toes extensively webbed, the last two phalanges of the fourth free; tips of fingers and toes dilated into small but well-developed disks; subarticular tubercles strong; inner metatarsal tubercle small, oval, blunt; a round outer metatarsal tubercle; no tarsal fold. Tibio-tarsal articulation reaching the tip of the snout; tibia more than half the length of head and body. Skin smooth above, or rough with small granular asperities; a narrow glandular dorso-lateral fold, strongest above the temple and shoulder; lower parts smooth. Grey or olive above, sides of head darker; tympanum brown; dorso-lateral fold not lighter; limbs with dark cross-bars; lower parts much spotted or marbled with dark brown, the throat and breast nearly entirely of a dark brown. Male with internal vocal sacs and a large, oval, flat gland on the inner side of the arm.

From snout to vent 77 millim.

Flores, above 3000 feet. Several specimens.

7. *Rhacophorus leucomystax*, Gravh.

Sumba.

8. *Sphenophryne monticola*, sp. n.

Tongue large, oval, entire. Snout short, rounded, with feebly marked canthus; interorbital space as broad as or broader than the upper eyelid; tympanum hidden. Tips of fingers dilated into well-developed disks, which are scarcely

larger than those of the toes; first finger shorter than second; toes free; a very indistinct inner metatarsal tubercle; no subarticular tubercles. The tibio-tarsal articulation reaches the shoulder or the temple. Skin smooth or with small warts above; belly indistinctly granulate. Coloration very variable. Grey, brown, or magenta-red above, uniform or with darker spots or marblings, with or without a yellowish-white stripe extending from the upper eyelid to the groin; a fine whitish line sometimes present along the vertebral line and along the hind limb; lower parts whitish or pinkish, inner side of hind limbs usually bright pink; throat speckled with brown or entirely dark brown.

From snout to vent 26 millim.

Lombok. Several specimens, collected at 4000 feet altitude.

Closely allied to *S. variabilis*, from S. Celebes; distinguished by the completely hidden tympanum and the smaller disks of the fingers.

9. *Callula baleata*, S. Müll.

Sumba.

10. *Bufo biporcatus*, Gravh.

Lombok.

11. *Hyla Everetti*, sp. n.

Tongue discoid or shortly oval, free and slightly nicked behind. Vomerine teeth in two small transverse groups in the middle between the choanæ. Head moderate, as long as broad; snout rounded, nearly as long as the diameter of the orbit; canthus rostralis indistinct, lores very oblique; nostril nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum very distinct, two thirds the diameter of the eye. Fingers one-third to half webbed; disks a little smaller than the tympanum; no projecting rudiment of pollex; toes webbed to the disks; a tarsal fold. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Skin smooth or with very small warts above; throat, belly, and lower surface of thighs granulate. Grey or brown above, uniform or with darker spots or marblings; back of thighs bright yellow, with large brown or black spots or marblings; lower parts white. Male with an internal vocal sac.

From snout to vent 48 millim.

Sumba and Savu. Numerous specimens.

LIII.—*Descriptions of some new Species of Scorpions of the Genus Tityus, with Notes upon some Forms allied to T. americanus (Linn.).* By R. I. POCKOCK.

THE identification of the specimens of *Tityus* obtained on the Lower Amazons by Messrs. Austen and Pickard Cambridge (see Ann. & Mag. Nat. Hist. April 1897, pp. 357-368) entailed on my part a re-examination of the literature of the subject and of the specimens contained in the collection of the British Museum, many fresh examples having been acquired since 1889 and 1893, when I ventured to discuss the affinities of the form then spoken of comprehensively as *americanus*. The result of this return to the subject has been the discovery of a considerable number of new forms; and since the name *americanus*, so far as can be judged, is equally applicable to many of them, and since we have no knowledge of the exact locality of the type, I have decided to discard this term until the type specimen has been re-examined and its structural characters accurately determined. This decision involves the restoration to use of the later names *obscurus* and *forcipula*, assigned by Gervais to two species congeneric with *americanus*, and previously regarded as synonymous with it.

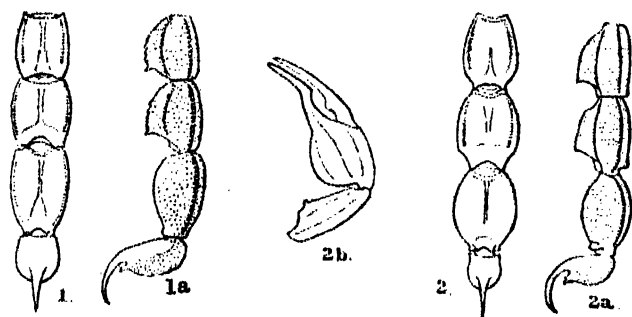
Tityus forcipula (Gervais). (Figs. 1, 1 a.)

Scorpio forcipula, Gervais, Arch. Mus. iv. p. 221 (1844); Ins. Apt. iii. p. 55 (1844).

This species was based upon specimens, of unknown locality, in the Paris Museum and upon one obtained by M. Goudot in Colombia. The latter, now in the collection of the British Museum, may be regarded as the type, as Gervais evidently intended (see Ins. Apt. iii. p. 55) should be the case. When discussing this species in the Ann. & Mag. Nat. Hist. for July 1889, I fell into the error of regarding *forcipula* as the male of *obscurus*, relying upon the accuracy of Gervais's identification as *obscurus* of a specimen in the British Museum, which is obviously the female of the type of *forcipula*. As a matter of fact, *obscurus* was based upon specimens from Cayenne (see Arch. Mus. iv. p. 219), and not upon specimens from Colombia, though Gervais himself referred Goudot's Colombian specimen, now in this collection, to that species. This specimen has but fifteen pectinal teeth, whereas the genuine *obscurus* is accredited with twenty-two; so that there can be very little doubt as to the distinctness of *obscurus* and *forcipula*. Some of the distinctive characters of the latter have

been set forth in the subjoined table of species; but we are at present in the dark as to the true nature of *obscurus*. The Museum, indeed, has two examples ticketed "Cayenne" which from their distribution might be referable to *obscurus*, but, unfortunately, these two examples represent probably two distinct subspecies or species; so that it is obviously unsafe to speak of either of them by the name *obscurus*. The specimens under discussion, it may be added, agree most nearly with the species described in my previous paper as *Cambridgei*; but, without knowing the male of the Cayenne forms, it is not possible to be sure of their identity with the Pará species.

Berthold ('Göttingische gelehrte Anz. Nachrichten' &c. 1846, p. 56 &c.) was no doubt correct in regarding his species *Gervaisii* as distinct from *obscurus*. It is likely enough, however, to prove identical with *forcipula*, though without an examination of the types or topotypes from Popahan, in Colombia, there can be no certainty on this head.



Figs. 1, 1 a.—Last three segments and vesicle of tail of *T. forcipula* ♂.

Figs. 2, 2 a.—Ditto of *T. pachyurus* ♂.

Fig. 2 b.—Hand and brachium of *T. pachyurus* ♂.

Tityus pachyurus, sp. n. (Figs. 2–2 b.)

Allied to *T. forcipula*, Gervais, in general form, but differing in the following particulars:—

♀. As in *forcipula* the tail is incrassate, the fourth and fifth segments being wider than the first, the width of the fourth and fifth being more than half their length; but the vesicle is much narrower, being a little narrower than the width of the brachium, but distinctly narrower than that of the hand, whereas in *forcipula* the vesicle exceeds in width the width of the brachium and hand; the vesicular spine, too,

is considerably further from the longer aculeus than it is in *forcipula*; the whole tail, too, is much smoother and armed with less coarsely denticulate superior crests. The hand is wider than in *forcipula*, being distinctly wider than the brachium, with keels much weaker and smoother; hand-back half as long as movable digit. *Pectines* fractured (number of teeth probably the same as in male).

♂. Differs from that of *forcipula* in much the same characters as the female, the keels and granules being much weaker and the vesicle only as wide as the brachium (much wider in *forcipula*), the aculeus being longer, with the tooth further from its base. The hand, on the contrary, is narrower, its width being equal to the length of that portion of the immovable digit that is distal to the tooth, whereas in *forcipula* it is much greater. Pectinal teeth 19 (in *forcipula* 16).

Measurements in millimetres.—♀. Total length 61, of carapace 7.3, of tail 41, width of its first segment 4.5, of fourth 5, of vesicle 3, of brachium 3.2, of hand 3.6.

♂. Total length 67; length of carapace 7.3, of tail 44, length of first and fourth segments 8; width of first segment 4.5, of fourth 6, of vesicle 3, of brachium 3.2, of hand 5.

Loc. Colombia. Two examples, male (type) and female, obtained from Turner.

Tityus macrochirus, sp. n. (Figs. 3–3 b.)

Allied to *pachyurus* and *forcipula*.

♀. *Colour* of trunk and tail brownish or greenish black; legs and chelæ, especially the latter, reddish yellow; fingers black. The transverse crests on the terga not so strong; the upper crests of the tail stronger than on the fourth segment, ending in a long denticle, as on the second and third; fourth segment a little wider than the first; vesicle smooth, punctured, without granules, a little wider than the brachium, but distinctly narrower than the hand, which is weakly keeled; digits shorter than in *pachyurus*, the length of the hand-back equalling almost two thirds that of the movable digit. Pectinal teeth 14–16.

♂. Tail as in the female, but longer and thicker, with its fourth segment a little wider than the first, its width much more than half its length; vesicle distinctly wider than brachium.

Chela longer and thinner than in *pachyurus*; brachium nearly four times as long as broad; hand much thicker than brachium, long, its width equal to half the length of the

hand-back, which exceeds the length of that part of the movable digit distal to the basal lobe; the digits relatively weakly sinuate and lobate.

Pectinal teeth 15-17.

Measurements in millimetres.—♀. Total length 64; length of carapace 7, of tail 39, width of its first segment 4, of fourth 4.1, of vesicle 3, of brachium 2.5, of hand 3.5; length of hand-back 5, of hand 8.1.

♂. Total length 68; length of carapace 7, of tail 44; width of its first segment 4, fourth segment 5, vesicle 3.4; length of brachium 11, of hand-back 8, of movable digit 10; width of brachium 3, of hand 4.1.

Loc. Bogotá (Colombia). Several specimens procured from Mr. I. da Costa.

Differs from the rest of the allies of *americanus* in its smooth vesicle, as well as in other characters appertaining to sex &c.

Tityus dasyurus, sp. n.

Closely allied to *T. metuendus*, Poc.

Tail robust, the fourth segment a little wider than the first, its width more than half its length, the fifth just twice as long as broad; vesicle as wide as the brachium, almost as wide as the hand; the intercarinal spaces of the tail thickly and coarsely granular (with the exception of the superior, which are only finely so).

Hand of chela scarcely wider than brachium, with strong and subgranular keels, the external finger-keel complete, the movable digit more than twice the length of the hand-back. Pectinal teeth 20.

Measurements in millimetres.—Total length 78; length of carapace 8, of tail 47, width of its first segment 4.7, of fourth 5, length of fourth 9; width of vesicle and of brachium 3.2, of hand 3.3; length of hand-back 5, of movable digit 11.2.

A single female example from Porto Rico (*Keyserling coll.*).

Tityus discrepans (Karsch).

Androcottus discrepans, Karsch, Mitth. Münch. ent. Ver. 1879, p. 11.

Of this species the British Museum has three specimens—one adult female ticketed "Brazil" (*Keyserling coll.*), a second adult female from Venezuela (*Keyserling coll.*), and one young individual from Caraccas (*Dr. Ernst*). Seeing that Karsch's type was also from Caraccas, there is no reason for doubting the identification of these specimens.

Although the male is unknown to me, the species is an

exceedingly well-marked one, the characters of which may be seen from the subjoined table.

Tityus androcottoides (Karsch).

Isometrus androcottoides, Karsch, Mitth. Münch. ent. Ver. 1870, p. 114.

Karsch gives no locality for this species, which he regarded merely as a variety of *americanus*. The British Museum, however, has half a dozen examples obtained in Demerara (British Guiana) by Messrs. Sclater, Turner, and Bower.

Specimens from Trinidad which were formerly referred by me to this species may be recognized from the Demerara forms by the characters mentioned in the synopsis given below, the characters being constant in the sixteen examples that I have seen.

Tityus trinitatis, sp. n.

Isometrus androcottoides (Karsch), Pocock, Ann. & Mag. Nat. Hist. 1889, iv. p. 57.

Tityus androcottoides, Pocock, Journ. Linn. Soc., Zool. xxiv. p. 377 (1894) (in part).

Differing from the closely related Guiana form, which agrees with Karsch's description of *androcottoides*, in having the two inferior keels on the second caudal segment distinct, those on the third united on the posterior third of the segment, and those on the fourth in the posterior two thirds of the segment. In Demerara specimens which I refer to *androcottoides* the lower keels are united on the posterior third of the second and on the posterior two thirds of the third.

Pectinal teeth 16-17.

Loc. Trinidad (*J. E. Broadway and J. H. Hart*).

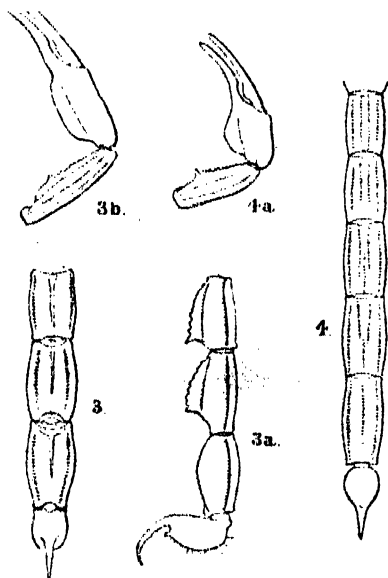
The characters of all the Trinidad specimens that I have seen are very constant in young and adults of both sexes.

Tityus magnimanus, sp. n. (Figs. 4, 4 a.)

♂. *Colour* a reddish brown, the fourth and fifth caudal segments, the vesicle, and digits blackish.

Tail barely six times the length of the carapace, which equals the length of its third segment, nearly parallel-sided, the third and fourth segments being only slightly wider than the first; the inferior keels complete on the second segment, but represented by a single median one on the posterior third of the third and on the posterior two thirds of the fourth; the intercarinal spaces almost smooth, scarcely perceptibly granular; the posterior granule of the upper crests of segments 2 to

4 enlarged. Vesicle a little wider than brachium, but narrower than hand. *Chelæ* not elongate, width of brachium almost half its length, its length just exceeding that of the carapace;



Figs. 3, 3a.—Last three segments of tail of *T. macrochirus* ♂.

Fig. 3b.—Hand and brachium of *T. macrochirus* ♂.

Fig. 4.—Lower side of tail of *T. magnimanus* ♂.

Fig. 4a.—Brachium and hand of *T. magnimanus* ♂.

hand large, its width nearly equal to the length of the hand-back and not much less than the length of the first caudal segment; hand-back about half the length of the movable digit; the digits separated basally, sinuate and lobate.

Coxæ and abdominal sterna only very feebly granular.

Pectinal teeth 19 (male and female).

♀. Young, 45 millim. in length, resembles the male in other than sexual characters. Tail a little narrowed posteriorly; vesicle a little narrower than the hand and brachium, which are subequal; movable digit a little more than twice the length of the hand-back.

Measurements in millimetres.—♂. Total length 68; length of carapace 7·3, of tail 43, width of its first segment 3·5, of fourth 3·8, of vesicle 3, of brachium 3, of hand 4·5; length of brachium 8, of hand-back 4·8, of movable digit 9·5.

Loc. Brazil. Two specimens, presented by E. E. Austen.

Though belonging to the *T. androcottoides* section, as shown by the fusion of the inferior caudal keels, this species differs from both *androcottoides* and *trinitatis* in having the tail, sterna, and coxæ much smoother. The sexual characters also are strikingly different, the carapace in the male of the last-mentioned being much shorter than the third caudal segment and less than one seventh the length of the whole tail. The chelæ, moreover, are slender, the width of the brachium being less than one third of its length, the hand narrow, digits contiguous, &c.

Synoptical Table of the previously discussed Species of the americanus Group of Tityus.

Males.

- α. Two inferior caudal keels on segments 2 to 4 distinct.
 - α¹. Vesicle without granules below, punctured; hand-back excelling carapace in length; (tail moderately robust, with strongly denticulate upper edges; chelæ long; brachium narrower than vesicle, much narrower than hand; 15-17 pectinal teeth) *macrochirus*, sp. n.
 - β¹. Vesicle granular below; hand-back less than length of carapace.
 - α². Vesicle much wider than width of brachium, its width nearly equal to the length of the first caudal segment and equal to the space between the anterior edge of the ocular tubercle and the posterior border of the carapace; the tooth close to the base of the aculeus; 15 pectinal teeth *forcipula*, Gerv.
 - β². Vesicle narrower, its width much less than the length of the first caudal segment and less than half the length of the carapace; tooth further from the base of the aculeus.
 - α³. Tail strongly incrassate posteriorly, width of the fourth segment exceeding half its length; hand large, much wider than brachium, its width exceeding half the length of the hand-back, digits strongly sinuate and lobate.
 - α⁴. Tail very stout posteriorly, the width of the fifth segment equal to the length of the second and just equal to the median length of the carapace; hand also much wider, with digits more strongly sinuate. *pachyurus*, sp. n.
 - β⁴. Tail less stout; the width of the fifth segment considerably less than

- the length of the second; hand narrower, its width at most equal to the length from the eye to the posterior margin of the carapace; digits less strongly sinuate *metuendus*, Poc.
- b*³. Tail slender, feebly incrassate, width of fourth segment less than half its length; width of hand equal to width of brachium, less than that of vesicle, and about one third the length of the hand-back; digits contiguous .. *Cambridgei*, Poc.
- b*. Inferior keels on the third and fourth (sometimes also on the second) caudal segments united to form a single median keel.
- a*⁴. Tail short, about six times the length of the carapace, which is about equal to the length of the third caudal segment; brachium less than three times as long as wide, the width of the hand about half the length of the movable digit; sterna and intercarinal spaces of tail much smoother; a median keel on the posterior third of the third caudal segment and on the posterior half of the fourth *magnimanus*, sp. n.
- b*⁵. Tail long, more than seven times the length of the carapace, which is much shorter than its third segment; hand and brachium narrower, the former more than three times as long as broad, the latter about one third the length of the movable digit in width; sterna and intercarinal spaces more coarsely granular.
- a*⁶. Inferior crests on the second caudal segment not united posteriorly, those of the third united in the posterior half of the segment and those of the fourth in the posterior three fourths of the segment. . *trinitatis*, sp. n.
- b*⁶. Inferior crests on the second caudal segment united in the posterior third of its length, of the third in the posterior two thirds, and of the fourth in the posterior five sixths *androcottoides*, Karsch.

Females.

- a*. Caudal segments 1 to 4 with a pair of parallel granular keels.
- a*¹. Vesicle punctured and smooth below; (hand obsoletely keeled, wider than vesicle; a strong terminal denticle on the upper crest of caudal segments 2 to 4; pectinal teeth 15-17) *macrochirus*, sp. n.
- b*¹. Vesicle serially granular below.
- a*². Vesicle large, its width very noticeably greater than that of the brachium and hand; spine close to base of aculeus (tail incrassate, very coarsely granular,

- upper keels of segments 2 to 4 strongly denticulate; hand strongly crested, as wide as brachium; pectinal teeth 16)... *forcipula*, Gerv.
- b*². Vesicle narrower, its width not greater than that of the hand and about equal to that of the brachium; spine further removed from base of aculeus.
- a*³. Tail thicker, width of the fourth segment more than half its length, its superior intercarinal space greater than the width of the brachium.
- a*⁴. Hand weakly keeled, broader, distinctly broader than the brachium; tail comparatively smooth, the granulation evanescent; stouter, the first segment nearly as broad as long.
- a*⁵. Tail thicker; width of fifth segment about two thirds of its length *pachyurus*, sp. n.
- b*⁵. Tail narrower; width of fifth segment only about half its length. *metuendus*, sp. n.
- b*⁴. Hand more strongly keeled, but narrower, only very slightly wider than the brachium; tail very coarsely and distinctly granular at the sides and below; first segment considerably longer than broad.... *dasyurus*, sp. n.
- b*³. Tail thinner; fourth segment about twice as long as broad, its superior intercarinal space (inside measurements) narrower than brachium; caudal segments less coarsely granular than in *b*⁴ *Cambridgei*, sp. n.
- b*. The inferior keels of segments 3 and 4 or 2, 3, and 4 united posteriorly or throughout their length.
- a*⁶. A single median keel on segments 2-4; abdominal sterna and intercarinal areas of tail smooth; upper caudal crests strongly denticulate *discrepans*, Karsch.
- b*⁶. A single median keel at most on the posterior half of the second caudal segment as well as on the third and fourth; abdominal sterna and intercarinal spaces of tail thickly granular.
- a*⁷. A median keel on the posterior third of the second caudal segment and posterior two thirds of the third and almost the whole of the fourth *androcottoides*, Karsch.
- b*⁷. The two paired keels on the lower side of second caudal segment not united, but united on the posterior half of the third and the posterior two thirds of the fourth *trinitatis*, sp. n.

To judge from the single immature female specimen of

T. magnimanus that I have seen, this species will fall under section *b'* of the above table, though differing from *trinitatis* in being less coarsely granular on the sterna and tail.

Tityus atriventer, sp. n.

Colour deep reddish yellow, thickly variegated with black on the trunk, limbs, and tail; abdominal sterna, as well as the coxæ and maxillary lobes of the cephalothorax, also marked with black patches; patches on the hands arranged in black lines.

Trunk granular throughout above; abdominal sterna also granular.

Tail nearly six times the length of the carapace, parallel-sided in female, posteriorly incrassate in male, the fifth segment being wider than the first; the median lateral keel weak on the second segment; the keels weak, weakly granular, the terminal granule on the upper keel of the second and third segments larger than the rest, the intercarinal spaces of the tail obsoletely granular; vesicle weakly granular, the spine beneath the aculeus slender and pointed, not blade-like as in some allied species.

Chelæ weakly granular, the crests moderately strong; hands in female a little wider than brachium, in male much wider, the hand-keels strong, obsoletely granular; digits with 13-14 rows of teeth, rather strongly lobate and sinuate in the male.

Pectinal teeth 14-15 in female, 15-16 in male.

Measurements in millimetres.—♀. Total length 38; length of carapace 4.5, of tail 24, width of its first segment and of fifth 2.3; width of brachium 2, of hand 2.2; length of movable digit 5.

♂. Total length 32; length of carapace 3.5, of tail 21, width of its first segment 1.8, of its fifth 2.2; width of brachium 1.5, of hand 2.3; length of movable digit 4.

Loc. Balthazar in Grenada (Antilles). Two specimens captured by Mr. H. H. Smith at an altitude of 250-300 feet under rotting leaves and the bark of a rotten log.

These specimens were received too late for notice in my paper upon the West-Indian Scorpions published in Journ. Linn. Soc., Zool. xxiv. pp. 374-409 (1894). It may be added, however, that the female differs from the female of all the species there recorded in having no lobate expansion at the base of the pectines; but, tested by the characters used in the table on p. 377, this new species falls alongside of *T. melanostictus* under section *a*². But from the latter it may be at

once recognized by having the abdominal sterna thickly granular and densely variegated, not to mention the infuscation of the coxæ and the presence of two crests on the fourth sternite. These two characters, in fact, coupled with the absence of the pectinal lobe, indicate a close relationship between *T. atriventer* and a group of species common in South America, of which *T. columbianus*, Thor., is a well-known example.

Some of the differential characters of this group of species are set forth in the accompanying table:—

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| a. Upper keels of second, third, and fourth caudal segments posteriorly elevated and ending in a strong triangular tooth. | |
| a ¹ . Vesicular tooth small, spiniform; tail coarsely granular..... | <i>columbianus</i> , Thor.
(New Granada.) |
| b ¹ . Vesicular tooth deep and blade-like; tail much more finely granular..... | <i>Quelchii</i> , Poc. (Dome-
rara.) |
| b. Upper keels of segments 2-4 not or hardly elevated posteriorly, at most ending in an enlarged granule. | |
| a ² . Vesicular tooth small and spiniform; tail obsoletely granular..... | <i>atriventer</i> , sp. n. Gre-
nada (W. Indies.) |
| b ² . Vesicular tooth deep and blade-like; tail and its keels more distinctly granular. | |
| a ³ . Vesicle and fifth caudal segment pale, not deeper in colour than the rest of the tail; hand in male only as wide as the brachium, digits not sinuate; fifth caudal segment not elevated..... | <i>pusillus</i> , Poc. (Igua-
rassu.) |
| b ³ . At least the vesicle much darker than the rest of the tail; hands expanded, fingers sinuate, and fifth caudal segment elevated in male. | |
| a ⁴ . Vesicular tooth very deep, obliquely truncate at the tip; coxæ of cephalothorax strongly infusate..... | <i>silvestris</i> , Poc. (San-
tarem.) |
| b ⁴ . Vesicular tooth less deep, more pointed apically; coxæ of cephalothorax scarcely at all infusate..... | <i>paraguayensis</i> , Kraep.
(Paraguay.) |

Tityus rufofuscus, sp. n.

Colour a uniform brownish black, like that of *T. pachyurus*.

Carapace with anterior border transverse, scarcely perceptibly emarginate; terga with the median longitudinal and

the transverse crests strong; the median crest distinct on the last; *sterna* finely granular, the last with the four crests distinct and granular, and two crests on the fourth sternite.

Tail relatively weak and slender, posteriorly narrowed, the first segment distinctly wider than the fourth, which is about twice as long as wide; all the intercarinal spaces, including the superior, finely granular; all the keels pronounced and granular, but none of the superior keels in any sense denticulate, evenly granular throughout; vesicle granular, distinctly narrower than hand, about equal to the brachium.

Chelæ sculptured as in the other species, except that the anterior surface of the humerus and brachium are evenly granular throughout (except for the presence of one basal denticle on the brachium), instead of being irregularly denticulate; hand with strong finely granular keels; the outer finger-keel also strong and almost complete, merely interrupted for a short space; the finger and hand exceeding in length the first two tail-segments and half the third, the movable digit twice the length of the hand-back, not lobate, nor is the immovable basally sinuate; 18 median rows of teeth on the digit, and the same number composing the outer and inner series.

Pectinal teeth 20; shaft not basally lobate.

Measurements in millimetres.—Total length 61; length of carapace 7, of tail 39, width of its first segment 3·5, of its fourth 3·1, of vesicle 2·8, of brachium 2·8, of hand 3·1; length of brachium 8·5, of hand-back 5, of movable digit 10.

Loc. Brazil (*E. Doubleday*).

Differing from the species allied to *forcipula* &c. in having no expansion of the base of the pecten, in having the upper caudal keels evenly granular, and the anterior surface of the humerus and brachium without irregular denticulations; tail narrower, &c. From *T. stigmurus* (Thorell), which it resembles in many characters, it may be distinguished by its uniform dark colouring.

LIV.—On *Sus verrucosus*, Müll. & Schleg., and Allies, from the Eastern Archipelago. By Dr. C. I. FORSYTH MAJOR.

ONE of the most striking and important characters of *Sus verrucosus* from Java, and its allies from Borneo, Celebes, the Philippines, &c., as well as of *Sus barbatus*, Müll. & Schleg., is to be found in the shape of the lower canines.

This was first pointed out by Nathusius* with regard to *S. verrucosus* proper, from Java. He stated that in *Sus* the transverse section of the lower canine forms a triangle; but whilst in *Sus scrofa* the posterior side is, next to the anterior one, the broadest, and the outer side only half as broad as the first named, in *Sus verrucosus* the outer side has almost double the breadth of the posterior one. A similar statement was made by Rütimeyer†, who, in his last paper on the subject‡, figures transverse sections of the lower canines of *Sus verrucosus*, *vittatus*, and *scrofa*.

The character alluded to, as well as the other distinctive characters of *S. verrucosus*, escaped the notice of J. E. Gray, when, in 1873 §, he figured and described three skulls belonging to the *verrucosus*-type, classing them into three distinct genera: the *Sus verrucosus* of Java, and "*S. celebensis*, Müll. & Schleg.," of Celebes, are called *Dasychærus*; a variety of the same from Amboina (Moluccas) is mistaken for a *S. vittatus*, and figured and described as the type of "*Aulacochærus vittatus*"; whilst an immature skull of the *Sus verrucosus* from Java is introduced as a new species of *Sus*, *S. mystaceus* ||; and an immature skull of the Celebes variety of *S. verrucosus*, from Macassar, is called *Sus timorensis*.

The Wild Hog from Ceram was rightly considered by Gray, in 1868 ¶, to be a variety of *S. verrucosus*; in the Hand-list (1873) the "var. *ceramicus*" is cancelled again, the Ceram Wild Hog figuring simply as *Sus verrucosus*.

In a communication made to the Pisa Society of Natural History, and of which only the conclusions were published in a very general manner**, I stated briefly that the *Sus Strozzi*,

* H. v. Nathusius, 'Vorstudien für Geschichte und Zucht d. Haustiere zunächst am Schweineschädel.—Anhang. Der Schädel von *Sus verrucosus*, Müll. und Schleg.' Berlin, 1864, p. 181.

† L. Rütimeyer, "Neue Beiträge zur Kenntniss der Torschweine.—Anhang. Ueber *Sus verrucosus*, Müll. und Schleg." (Verh. naturf. Ges. Basel, iv. 1, 1865, p. 184).

‡ L. Rütimeyer, "Einige weitere Beiträge über das zahme Schwein und das Hausrind" (Verh. naturf. Ges. Basel, vi. 1878, p. 468, pl. facing p. 495, fig. 7).

§ J. E. Gray, 'Hand-list of the Edentate, Thick-skinned, and Ruminant Mammals in the British Museum,' London, 1873, pp. 58-60, 62, pl. xxiv. figs. 1-3, pl. xxvi.

|| See the correct reference of this name to *S. verrucosus* by O. Thomas, as quoted by Nehring, with his own remarks on the same in "Ueber die javanischen Wildschwein-Arten," etc. (Zool. Garten, xxxvi. 1895, p. 45).

¶ P. Z. S. 1868, p. 24, and Cat. Carniv. &c. (1869) p. 330.

** Forsyth-Major, "Studi sugli avanzi pliocenici del genere *Sus* (*Sus Strozzi*, Menegh.)" (Atti Soc. Tosc. Sc. Nat. Pisa, vol. ii. 13 marzo, 1881, p. 227).

Men., of the Upper Pliocene of the Val d'Arno, bears more relation to the species of *Sus* of the Indian Archipelago, and, above all, to *Sus verrucosus* of Java, than to *Sus scrofa*. The characters of the skull of the young *S. scrofa* are permanent in *S. Strozzi*, as well as in the Indian members of *Sus* generally, and more particularly in *S. verrucosus*; one of the characters referred to* is in the shape of the lower canines.

This statement requires some further explanation. In some Middle Tertiary members of *Sus* no difference is to be found between the two sexes in the size or shape of the tusks; both have their lower canines of moderate size and width, the outer and inner side being of equal breadth. This condition is more or less maintained permanently by the females of Pliocene and recent members of the genus, whereas in some Pliocene forms of *Sus* the male sex acquires much larger inferior canines, in which, however, the relative proportions of size of the three sides, as seen in the females, as well as in both sexes of forms more ancient than these Pliocene ones, are still preserved. Gradually, however, these relative proportions become altered, till at last we come to have the male *S. scrofa*-type of lower canines, as described by Nathusius; but, as a matter of fact, even in this modernized type the canine of young males shows the original conformation.

The Pliocene forms of *Sus*, which have the above characters, are, as I long ago † pointed out: "*Sus giganteus*," Falc. & Cautl., from the Pliocene of the Siwaliks ‡, and *S. Strozzi*, from the Upper Pliocene of Italy (Val d'Arno, Olivola, &c.); and I then mentioned that not only *S. verrucosus* resembles these fossil forms in this as well as in other respects, but that *S. barbatus* shows the same conformation of lower canines §.

Nehring has dealt with the same argument, so far as recent Suidæ are concerned, particularly in two of his numerous important papers on the group ||; and recently Heude enters into minute particulars as to the enamel-sculpture and shape of the lower canines of *Sus*, to illustrate which are devoted

* See also Forsyth Major in Atti Soc. Tosc. Sc. Nat. vii. 1890, p. 61.

† "Studien zur Geschichte der Wildschweine" (Zool. Anzeiger, 1883, p. 209).

‡ I had in view the fig. 17, pl. 71, of the 'Fauna Antiqua Sivalensis.'

§ See also Forsyth Major, "L'Ossario di Olivola in Val di Magra (Prov. di Massa-Carrara)" (Atti Soc. Tosc. Sc. Nat., Proc. Verb. vii. 1890, p. 61).

|| Sitzungsber. Ges. naturf. Freunde zu Berlin, 21 Febr. 1888, p. 9.

A. Nehring, "Ueber *Sus celebensis* und Verwandte" (Abhandl. und Berichte d. k. Zool. und Anthropol.-Ethnogr. Museums zu Dresden, 1880-89, no. 2: Berlin, 1889, p. 11).

three quarto plates, twenty-four different types being figured *. The various forms of *Sus* of the Indian Archipelago are comprised under the denomination of *Nesosus*, and the remarkable fact is brought to notice that on the continent, in Cochinchina, occurs an unmistakable member of the *verrucosus* type.

It might be a matter of discussion whether a new generic term was needed (if so, Gray's *Dasychærus* would have the priority); but at any rate its eventual utility is neutralized by deliberately including in it the *S. vittatus* †.

Heude apparently is acquainted with the Siwalik Suidæ only by what is reproduced of them on pl. ix. (*Sus*) of Blainville's 'Ostéographie'; this might explain how he comes to state that "on sait que les origines des terrains tertiaires sous-himalayens ne nous reportent pas au *Nesosus*" ‡. It may be seen, from what I have said above, that the contrary is true.

1. *Sus verrucosus mindanensis*, subsp. n.

Alluding to my paper in the 'Zool. Anzeiger' §, Nehring || declares that he cannot completely approve of the somewhat radical manner of my reducing all the living species of *Sus* to three or four, viz. *S. barbatus*, *S. verrucosus*, *S. vittatus*, *S. scrofa*.

My proceeding might perhaps more appropriately be termed conservative, whilst I would call radical the introducing of about 35 new species of *Sus* by Père Heude. Apart from this, from what Nehring formerly stated on the same sub-

* P.-M. Heude, S.J., 'Etude sur les Suilliens' (Mém. concernant l'Hist. Nat. de l'Empire Chinois par des Pères de la Compagnie de Jésus, t. ii. 2, Chang-Hai, 1892, p. 87, pl. xxix. A, B, C).

† L. c. p. 85.

‡ L. c. p. 101.

§ L. c. p. 295 *sqq.*

|| 'Ueber *Sus celebensis* und Verwandte,' p. 27: "Die etwas radicale Art und Weise, in welcher Forsyth Major in seiner . . . Abhandlung, die sämtlichen lebenden *Sus*-Arten auf 3 resp. 4 reducirt, nämlich auf *S. barbatus*, *S. verrucosus*, *S. vittatus*, und eventuell *S. scrofa*, kann ich nicht ganz billigen. Einerseits ist *S. celebensis* nach meiner Ansicht eine 'gute Art', andererseits finden sich unter den von Forsyth Major zu *S. vittatus* gerechneten Formen mehrere, welche von einander sicher unterschieden werden können" [here reference is made to two of the author's papers, 'Zool. Anz.' 1885, p. 352, and 'Zool. Garten,' 1885, p. 384, in which similar opinions were expressed]; "überhaupt ist die Auseinanderhaltung der einzelnen Local-Rassen resp. Subspecies bei den Wildschweinen von unzweifelhafter Bedeutung für ein tieferes Eindringen in den Process der Artbildung nach Raum und Zeit, was auch Forsyth Major anerkennt."

ject * it appears that he was partly influenced by the views expressed by Lydekker; but from what he says in the passage quoted, it can be seen that on the whole our views are not so very different. In the present instance we have especially to deal with the question, whether it be more convenient to rank the Celebes Wild Hog as a species distinct from the Javan *S. verrucosus*, or to call it merely a variety of the latter. The former course is followed by Nehring, whilst I advocated the latter. I would see no difficulty in adopting, for convenience' sake, Nehring's mode of naming, if there were no other but the two forms just mentioned †; but there are others, which I am going to discuss; so that my answer to Prof. Nehring is contained in the following pages.

Dampier, in 1686, mentions the Wild Hogs of the Isle of Mindanao (Philippines) in the following words:—"The Hogs are ugly Creatures; they have all great Knobs growing over their Eyes, and there are multitudes of them in the Woods. They are commonly very poor, yet sweet." ‡

In a paper contributed to the Transactions of the Royal Society of London, the Jesuit Missionary Camel enumerates, apart from the domestic pig, three kinds of wild hogs from the Philippines §:—

"No. 25. Ababa. *Aper brevipes*.

"No. 26. *Porci item species pygmaei, feri, cursu velocissimi*.

"No. 27. Bayong s. Pagil. *Aper montanus*.

"No. 28. Babuy. *Sus domestica*."

Two of the above native names are mentioned also by E. v. Martens, who writes as follows respecting the Wild Boars of the Philippines ||: "Wildes Schwein, *javali* der Spanier, *baboy damo* der Tagalen, an anderen Orten *pugil*, *bayong* etc.

* A. Nehring, "Ueber eine neue Art von Wildschweinen (*Sus longirostris*, Nehring) aus Südost-Borneo" (Zool. Anzeiger, no. 197, 1885, p. 352). As to Lydekker's opinions, see below.

† I have myself of late (P. Z. S., March 16, 1897) proposed to maintain the Madagascar Wild Hog as a separate species, although it differs not more widely from the *Polamocheirus chacropotamus* (Desmoul.) (*P. africanus*, auct., *P. larvatus*, auct.) than does "*Sus celebensis*" from the Javan *S. verrucosus*. But I would have to change my view if there were found in Madagascar other forms of wild hogs, differing less from *P. chacropotamus* than those I am acquainted with.

‡ William Dampier, 'A new Voyage round the World,' vol. i. 7th ed. (In 'A Collection of Voyages in four Volumes.' London, 1729. Vol. i. p. 320: Isle of Mindanao anno 1686.)

§ "De Quadrupedibus Philippensibus Tractat. a Reverendo Georg. Jos. Camel transmissus Jacobo Petiver, Pharmacop. et Societ. Regim Soc. Londini" (Philos. Trans. vol. xxv. for the years 1706 and 1707, London, 1708, pp. 2200, 2201).

|| Pr. Exped. nach Ost-Asten, Zool. Theil, i. p. 195.

genannt, überall häufig, von Cagayán, der nördlichsten Provinz Luzons, bis Mindanaó, das Fleisch allgemein geschätzt."

Only during the last few years have we received some more accurate information about these Wild Hogs. In 1888 Huet described and figured a new species from Luzon, *Sus Marchei**. The figure of this skull is rather indifferent and not trustworthy, as Nehring has pointed out.

A careful description, with figures, of a wild hog from Luzon (Philippines) is given by Nehring†, under the name *Sus celebensis* var. *philippensis*, Nehring†. In a later paper‡, the same author has shown that *S. Marchei*, Huet, is identical with *S. celebensis* var. *philippensis*, Nehr.

The skull of the male *philippensis*, as compared with the male *celebensis*, is characterized as follows by Nehring || :— The skull from the Philippines is lower, more elongate, and has a narrower snout than is generally the case in "*S. celebensis*" from South Celebes. The osseous crest above the alveolus of the upper canine is lower and not so thickened behind as in *celebensis*, more resembling the Javan *verrucosus* in this respect.

So far, these characters apply as well to the skull of an adult male in the British Museum (91.11.28.3) from Ayala, Mindanao, but it carries them farther still and has, besides, characters of its own. In length (basal length 269 millim.) the Mindanao skull slightly exceeds the two male skulls described by Nehring (259 and 252 millim.), whilst all the principal dimensions of height and breadth remain below those of the two skulls from Luzon, absolutely under those of the larger one, and relatively—when reduced, as in the following figures, to percentages of the basal length—under those of the smaller one :—

	M.	L.
Relat. breadth of skull at largest (between zygom. arches).....	48.3	52.5 . 51.2
Relat. frontal breadth at largest (between post-orbital processes of frontal)	32.7	34.7 . 33.7
Relat. frontal breadth at narrowest	22	23.2 . 22.2
Relat. breadth of occipital squamæ (slæ)	20.4	33.2 . 20.4
Relat. breadth of mandibula between the condyles	40.8	44 . 42.5
Relat. height of occiput	40	45.6 . 40.5
Relat. height of skull (resting on mandibula)..	63.2	78.4 . 68.6

* 'Le Naturaliste,' Jan. 1888, pp. 5-7. See also Nehring in Sitzungsber. Ges. nat. Fr. 1894, p. 192 footnote, and p. 219.

† "Ueber *Sus celebensis* und Verwandte" (l. c. pp. 14-17, 24-26, Taf. i. figs. 3, 4, Taf. ii. fig. 4).

‡ Heude has erroneously attributed this name to Huet (l. c. 1892, p. 86, 1894, p. 217).

§ Sitzungsber. Ges. nat. Fr. 1894, p. 220.

|| "Ueber *Sus celebensis* und Verwandte," p. 15.

Peculiar features of the Mindanao skull are to be found in the considerable length of the snout:—

	M.	L.
Relat. length of intermaxilla at alveolar border	26·4	24·7 . 23·8

The nasals of the Mindanao skull are very narrow in the middle of their length; but the whole of the nasal region still remains remarkably broad, on account of the overlapping of the intermaxillæ on the upper surface of the nasal region.

On placing side by side the Mindanao skull with those of the Celebes form and the *verrucosus* proper from Java, there can remain no doubt that the first differs as much from the second as this latter does from the third. So that if the Celebes Wild Boar is to be maintained as a distinct species, it would be only consistent to raise the Mindanao form as well to specific rank. Of course, it results from the foregoing remarks that the Luzon form holds in most respects an intermediate position between *mindanensis* and *celebensis* (contrary to what might have been expected from the geographical position of its habitat). But, on the other hand, the Bornean form of *verrucosus*, to be considered hereafter, intervenes between *celebensis* and *verrucosus* of Java, by the considerable breadth between the zygomatic arches and by the relative shortness of the last molar.

Lastly, to connect all these forms still closer together, almost all the characters by which *philippensis* and *mindanensis* differ from *celebensis* are such as approach the first two to the Javan *verrucosus*.

Under these circumstances I cannot see my way to establishing a new species for the Mindanao form, and still less can I range it as a variety under a species *S. celebensis*. But I prefer to treat it as a subspecies of *S. verrucosus*, Müll. & Schleg., on equal rank with *S. verrucosus celebensis*, *S. verrucosus philippensis*, Nehr., and the other forms with which I have still to deal. *S. verrucosus* of Java becomes the type of the species on no other than priority grounds.

Heude has of late described and figured no less than seven new species of *Sus* from the Philippines: 1. *Sus effrenus*; 2. *S. frenatus*; 3. *S. microtis*; 4. *S. cebifrons*; 5. *S. minutus*; 6. *S. arietinus*; 7. *S. calamianensis* *. Four of these, viz. 1, 2, 3, 6, are from the Island of Luzon; the first-named three from one locality, Jala-Jala, "une langue de terre de huit kilomètres de côté; elle termine la grande péninsule dépendant de la province de Moron, dans le lac de Bay" †.

* "Notes sur quelques crânes de Sangliers des Philippines" (*l. c.* li. 4, 1894, p. 212).

† *L. c.* p. 216.

To judge from the short description of the skulls and dentition and from the figures—unfortunately no measurements are given,—none of these four "species" can be separated from Nehring's *S. celebensis* var. *philippensis*.

In applying the criteria for specific distinctions resorted to by Père Heude to the crania of the Indian "*Sus cristatus*" in the Natural History Museum, from 12 to 15 different species of Indian Wild Boars might be easily distinguished. We must, however, be grateful to the author for showing us the amount of variability in these forms, even those from the same island.

The skull of "*S. cebifrons*," from Cebu*, conveys the impression of being that of a more or less domesticated animal, possibly a cross with a domestic pig—a not unfrequent occurrence in those islands, according to Père Heude's statement †.

Of "*Sus minutus*" ‡, distinguished by its small size, the very simple structure of its molars §, and the large size and elevation of premolars ||, which characters distinguish it from *mindanensis*, no habitat is given in the description; but I understand, from what is said incidentally ¶, that it occurs in Mindanao—so that there seem to be two forms of wild pigs in Mindanao.

Of "*S. calamianensis*" we shall have to say something later on.

2. *Sus verrucosus amboinensis*, subsp. n.

There are two skulls (both males) of the Wild Boar of Amboina (a small island to the south-west of Ceram) in the Natural History Museum, 59.6.4.6 (1362 c) and 59.6.4.5 (1362 d) **; both were collected by A. R. Wallace, and figure in the catalogues under the head of *S. vittatus*. Rolleston was aware that the skull 1362 d is a "*Sus verrucosus*" ††, but, by a strange inadvertance, he mentions on the opposite page

* Pl. xxviii. figs. 1, 2, 3.

† T. ii. 1894, p. 312.

‡ L. c. p. 218.

§ Pl. xvii. figs. 6-8.

¶ L. c. pl. xx b. fig. 1.

¶ L. c. ii. 3, 1894, p. 129.

** Gerrard, 'Catalogue of the Bones of Mammalia in the Collection of the British Museum,' 1862, p. 277; J. E. Gray, "Synopsis of the Species of Pigs (Suidæ) in the British Museum," P. Z. S. 1868, pp. 25, 26; J. E. Gray, 'Catalogue of Carnivorous, Pachyd., and Edent. Mammalia in the Brit. Mus.,' 1869, p. 331; J. E. Gray, 'Hand-list of the Edentate, Thick-skinned, and Ruminant Mammals in the British Museum,' 1873, p. 68, with figure (profile) of 1362 c, pl. xxiv. fig. 3.

†† Trans. Linn. Soc. (2) i. 1877, p. 271.

the other skull from Amboina as belonging to *S. vittatus* *. This is the same skull which, as pointed out above, is figured in profile in the 'Hand-list,' with the inscription *Aulacochærus vittatus* †.

Whilst *mindanensis* approaches *philippensis*, the present Amboina form is more closely related to *celebensis*, so as to agree with the last in all the characters in which *philippensis*, according to Nehring ‡, departs from it; the agreement is closer still than between *philippensis* and *mindanensis*.

The skull of *amboinensis*, then, is higher and broader than *philippensis*, and still more so than *mindanensis*. Whilst the basal length of the latter form is equal to that of the Amboina wild pigs (M.=269, A.=270 . 268), the united parietals and frontals are considerably longer in A. (164 . 169, M. 149), whereas the nasals are much shorter (A. 153 . 155, M. 164). Taking *philippensis* into account as well, the percentage lengths stand thus :—

	M.	P.	A.
Parietals and frontals	55·4	58·7 . 57·3	60·74 . 63
Nasals	61	60·6 . 57·3	56·7 . 57·8

The postorbital region is not only high in *amboinensis*, but it is elongate as well. Dividing, after Nathusius's method, the upper surface of the cranium proper in two parts, by means of an auxiliary frontal line connecting the postorbital processes across the forehead, we find the following proportions in the lengths of the two parts :—

	M.	A.
Percentage from root of the nose to frontal line....	24·3	22·4 . 28·7
Percentage from frontal line to occipital margin ..	32	39·2 . 41

This is one of the characters in which *mindanensis* approaches more closely *S. verrucosus* from Java, and still more the *Sus verruc. ceramicus* from Ceram (see below); whereas in the following it is, as we have seen, at the one extreme, *verrucosus*, with its very short snout, at the other, whilst *amboinensis* holds the middle :—

* L. c. p. 270. In the same place measurements are given of the lachrymal of an immature skull of "*Sus vittatus*," Brit. Mus. 1962 f, which in reality is a young *S. verrucosus*; and so is the skull 1962 g enumerated in the Catalogue (Cat. Carniv., Pachyd. &c. p. 332; Hand-list Edent. Mamm. p. 58) as *S. vittatus*; "*Sus timoriensis*," 1601 c, from Macassar (Cat. Carniv., Pachyd. &c. p. 335; Hand-list Edent. Mamm. p. 60) is the skull of a young of *S. verrucosus celebensis*.

† Pl. xxiv. fig. 8.

‡ The *celebensis* of North Celebes, however, differs less from *philippensis*, according to Nehring ('Ueber *Sus celebensis* und Verwandte,' p. 15).

	M.	A.	C.
Percentage length of molar region of palate (see Nathusius)	46.3	49.4 . 50.2	52.4
Percentage length of incisor region of palate (see Nathusius)	26.8	24.3 . 22.9	20.9

The crest above the canines in *amboinensis* has a somewhat different shape from what obtains in *philippensis* and *mindanensis*, and agrees with *celebensis*; it is higher than in the first two and considerably thickened behind.

The zygomatic arches bend out more suddenly in *amboinensis* than in *mindanensis* or *philippensis*, which last two in this respect again more approach *verrucosus* from Java, whilst *amboinensis* ranges with *celebensis* and with the Bornean form of *verrucosus*.

Again, as compared with *mindanensis* and *philippensis*, in *amboinensis* (and *celebensis*) the whole of the mandibula is higher and broader, and the ascending ramus longer antero-posteriorly and more vertical; the greater height contributes towards increasing the height of the whole skull when resting on the mandibula in its natural position. In this respect, however, there appears to occur variations in the skull of the *philippensis* from Luzon *, as also in the height of the skull, independently from that of the mandibula (percent. height of occiput in the two skulls described by Nehring 45.6 . 40.5).

The molars of *amboinensis*, as compared with those of *mindanensis*, are not so narrow, their enamel less delicately wrinkled, and they are less regularly inserted; whilst in *mindanensis* their outer margins lie in a line almost parallel to the long axis of the skull, they form in *amboinensis* a convex line outwardly. As compared with *celebensis*, the third molars of *amboinensis*, though short, are slightly more complicated.

There are to be noticed some small variations between the two skulls from Amboina. The skull 1362 *d*, which, to judge from the wear of the teeth, was a somewhat younger specimen than 1362 *c*, shows the upper contour slightly more concave in the region of the naso-frontal suture. In the same skull this region, viewed from above, is, together with the anterior frontal and the whole nasal region, more flattened and broadened than in 1362 *c*; behind and above the supra-orbital foramina the frontal region of the former skull (1362 *d*) ascends steeper towards the occiput and is more convex from side to side and from before backwards. Both skulls show feebly raised rugosities on their outer nasal

* See "*S. frenatus*," Heude, *l. c.* tome ii. 1894, p. 216, pl. xxvii. fig. 5.

margins; in 1362 *c* they are about 7·5 millim. wide and 34·5 millim. long, and terminate near the back end of the nasals, so that they are not situated directly opposite the crests above the canines, but with two thirds of their length backwards from those crests. In 1362 *d* these crests are less distinct. Nehring has pointed out the same conformation in a skull of *celebensis*, and rightly remarks that they call to mind what occurs in *Potamochoerus**. The "wart" supported by the crest and the nasal rugosities of *verrucosus* is, of course, the exact homologue of the similar but much stronger developed horn-like cartilage in the males of *Potamochoerus*, and I expect that, as in the latter genus, it will be found to be missing in females and young individuals of the *verrucosus* group.

In the foregoing description of the Amboina pig I had continually to point out its close resemblance to *celebensis*. This is clearly shown as well by the comparative dimensions. In the table of measurements will be found the average percentage measurements of six skulls of male *celebensis*, calculated from the absolute dimensions given by Nehring†. By comparing these with the percentage dimensions of *amboinensis*, it will be seen that there prevails a close agreement in almost all the figures. In absolute size the Amboina skulls agree with the largest of *celebensis*, the basal length varying in the six skulls of C. (see Nehring) from 234–267 millim., as against 268 and 270 millim. in the two skulls of A.

The following few divergences between C. and A. may here be pointed out, the more so as the measurements upon which they rest have, for sake of space, been omitted in the table of measurements.

The canines of *amboinensis* appear to be a little larger; the longest diameter in the alveoli of the upper canines in C. varying from 17–21 millim. (percent. 7·3–8), in A. from 26·5–29 millim. (percent. 10–10·7). The lachrymals, too, are shorter in *celebensis*:—

	A.	C.
Percentage dimensions of lower margin of lachrymal	8·9–9·3	5·6–7·1
Percentage dimensions of upper margin of lachrymal	15·5	11·9–12·6

Contrary to the opinion expressed by myself, Lydekker has endeavoured to show that in the form of the cranium *Sus vittatus* comes nearest, amongst living forms, to the

* 'Ueber *Sus celebensis* und Verwandte,' p. 10.

† *L. c.* p. 30.

Siwalik *Sus giganteus*, Falc. & Cautl. At the same time he upholds the separation of the Indian *S. cristatus* from the "Javan etc." *S. vittatus* *. Mr. Lydekker has, I apprehend, been completely misled by the confusion above alluded to in the naming of the skulls. For the form of the cranium of *S. vittatus* he refers † to fig. 3, pl. xxiv. of the 'Hand-list,' "*Aulacochærus vittatus*," so that, as a matter of fact, it is *S. verrucosus amboinensis* which he is comparing with *S. giganteus*. Again, when giving his reasons for the assumed specific distinctness of *S. vittatus* from *S. cristatus*, against the view propounded by Rütimeyer and myself, he assigns to *S. vittatus* characters which in reality are those of members of the *verrucosus* group:—"In *S. vittatus* m. 3 is normally shorter than in *S. cristatus*; its length, especially in the lower jaw, in all typical examples that have come under the writer's notice being less than that of m. 1, m. 2. . . ." ‡. In a footnote it is stated that "No. 1362 B, British Museum, is an exception, but this specimen not improbably belongs to *S. verrucosus*" §. Of the four skulls enumerated in the 'Hand-list' under the heading of "*Aulacochærus vittatus*" (*Sus vittatus*) §, one (1362 f) is an immature *Sus verrucosus*, two others (1362 c & d) are the above-described *S. verrucosus amboinensis*, and a fourth (1362 g), *sine patria*, corresponds almost in every particular with *S. verrucosus celebensis*, but has the third molars a little more complex. The skull 1362 B, mentioned by Lydekker, was brought from Java by A. R. Wallace ||, but, far from having anything to do with *S. verrucosus*, it is precisely one of the few skulls labelled *S. vittatus* which is not *S. verrucosus*.

The comparisons instituted by Mr. Lydekker, therefore, strengthen my opinion that it is with the *verrucosus* group, more especially with *amboinensis* and *celebensis*, and not with *S. vittatus*, that *S. giganteus* presents the closer relation. Without entering here more fully into the argument, it may be pointed out that, if we do not limit our comparisons to the Amboina skull, 1362 c, alone, the analogy appears still closer. In the second skull from Amboina, 1362 d, and in several skulls from Celebes, the occipital height is quite as considerable as in the fossil. Again, the Amboina

* R. Lydekker, "Siwalik and Narbada Bunodont Suina" (Mem. Geol. Surv. India. ser. x. vol. iii. pt. 2, Calcutta, 1884, pp. 50, 54, 58, 59 (16, 20, 24, 25)).

† L. c. p. 58 (24), footnote.

‡ L. c. p. 50 (16), and footnote 5.

§ P. 58.

|| Catal. Bones Mamm. p. 277; Catal. Carniv., Pachyd. &c. Mamm. p. 332.

skull 1362 *d*, *celebensis* generally, and the Bornean form of *verrucosus* * have still more prominent zygomatic arches than the skull from Amboina with which Lydekker compared the fossil.

3. *Sus verrucosus ceramicus*, Gray.

A skull of an adult male (B. M. 712 *d*) from Ceram, collected by A. R. Wallace. As mentioned above, Gray originally † considered this skull—rightly, in my opinion—to be a variety of *S. verrucosus*; in the 'Hand-list' it figures with the *Sus verrucosus* of Java as "*Dasycherus verrucosus*" ‡.

On account of the slenderness of the snout, this skull presents a very elegant appearance. In length it is equal to weaker specimens of the Javan form; in relative breadth of the zygomatic arches (see table of measurements no. 5) it is the narrowest of all the forms of *verrucosus* which have come under my notice; in relative breadth of the front (nos. 6, 7) it ranges with the narrowest specimens of *S. verrucosus*. In relative height (nos. 15, 16) this skull is surpassed by all the members of the group with the exception of *mindanensis*. The nasal region is very narrow as compared with all the other skulls of the *verrucosus* type. The crest above the canine is weak—short, low, and narrow.

Of the last molar of this specimen Rolleston has stated § that it is comparatively simple as compared with other specimens of *S. verrucosus*. This remark holds good with regard to all the molars and premolars of *ceramicus*; thus it approaches *celebensis* and *amboinensis*; in the elongation of m. 3 it, however, ranges with *verrucosus* from Java.

In a paper by Jentink || mention is made of a *Sus ceramicus*, Rosenberg (Malayisch. Archipel. 1878, p. 362), said to occur in enormous quantities in Ceram and on all the islands from Ceram-laut to Tjoor. Besides, there are in the Leyden Museum skins from Tidore, Ternate, and Waigeou, collected by Dr. Bernstein; and Jentink is of opinion that all these are one and the same species, and identical with *Sus niger*, Finsch ¶, from New Guinea.

* 1362 *a*, not 1362 *b*; see below *S. verrucosus borneensis*.

† P. Z. S. 1868, p. 24, and Cat. Carniv. &c. 1869, p. 890.

‡ Hand-list &c. 1873, p. 59.

§ Trans. Linn. Soc. 1877, (2) i. p. 271.

|| F. A. Jentink, "On the Malayan and Papuan Pigs in the Leyden Museum," Notes from the Leyden Museum, vol. xiii. Note vi. (Leyden, 1891) pp. 85-104.

¶ P. Z. S. 1866, p. 217.

Jentink, moreover, suggests that Gray's *S. verrucosus*, var. *ceramica*, described above, may prove to be the same as Rosenberg's *S. ceramensis* and Finsch's *S. niger*. This may be; however, so long as the only information we have to rely on is to the effect that these various pigs are of a "uniform black" colour, it is useless to waste time in conjectures. From what Rolleston says * respecting a skull of a pig from Ternate, which is identical in age and conformation with one in the British Museum ("*Sus timorensis*," 1501 b) †, one thing is certain, viz., that in the island of Ternate exists a wild pig of the *vittatus* type which has nothing to do with *verrucosus*.

4. *Sus verrucosus borneensis*, subsp. n.

The skull of an old male in the British Museum (59.8.16.5—1362 a) ‡ from Borneo, collected by Mr. A. R. Wallace, is, to my knowledge, the only known specimen of a *verrucosus* from Borneo. It is the very opposite of *ceramicus*, being a massive cranium, short and broad, in this character approaching *celebensis* and *amboinensis*, by both of which, however, it is surpassed in height and in the greater elongation of the incisor region (see dimensions below). The crests above the upper canines are of moderate size, as in *S. verrucosus* from Java.

5. *Sus barbatus balabacensis*, subsp. n.

In 1888 Huet described and figured a new species of *Sus* (*S. ahænobarbatus*) from Palawan Island, between Borneo and Mindoro (Philippines), pointing out the supposed differences of the skull from *S. barbatus* of Borneo §. In the following year, Nehring, without being aware of Huet's paper, gave measurements and a provisional description of the skull and

* *L. c.* p. 276. Rolleston, after describing the skull, adds:—"The colouring, however, of the head of this *Sus* differs from that of any other *Sus* seen by Dr. A. B. Meyer,—or figured by Schlegel—the head being covered all over with long black hair, except in the region occupied by a broad yellowish-brown streak beginning between the eyes and descending to the snout, where it broadens."

† Gray, *Catalogue Carniv. &c.* 1869, p. 335: "*S. timorensis*, 1501 b, ... a wild pig, Ternate, from Mr. Wallace's collection."

‡ 'Catalogue of Bones,' 1862, p. 277, under the head of *Sus vittatus* (a); *Catal. Carniv. &c.* 1869, p. 330, under *Sus verrucosus*; *Hand-list &c.*, 1873, p. 59, under *Dasychaerus verrucosus*, where, by a misprint, it bears the number 136 a.

§ 'Le Naturaliste,' Jan. 1888, p. 5.

a skin of a wild hog from the same island, naming it "*Sus barbatus*, var. *palavensis*, Nehr." *

Heude has since † made known the skull and teeth of his *Sus calamianensis* from the Calamianes Isles, situated between Mindoro and Palawan, the name having already been published in 1888 in the explanation of a plate showing the upper and lower premolars. Heude refers his species with a query to "*S. longirostris*, Nehr.," and states that "*S. ahænobarbus*, Huet," belongs to the same group.

In the same year Nehring ‡ corrects some errors in the description, measurements, and figures of "*S. ahænobarbus*" (the skull named *S. ahænobarbus* is that of *S. Marchei*, Huet, and *vice versa*), which he is inclined to consider as identical with his own *S. barbatus* var. *palavensis*.

In the same place § short mention is made of the skull of an adult male from Culion (Calamianes group), and the opinion is expressed that *S. calamianensis*, Heude, is a second variety of *S. barbatus*, "*S. barbatus* var. *calamianensis*, Nehring." A detailed description is promised.

The Natural History Museum received some years ago from Mr. A. H. Everett four skulls of a wild pig from Balabac Island (between Borneo and Palawan), one (B.M. 94.6.8.8) being from a male and three of females (B.M. 94.6.8.7—94.6.8.9—94.6.8.10). The male is almost completely adult, the two anterior thirds of the last molar being in use. Of the female skulls, one (10) is immature, the last molar being almost unworn; skull 9 is of an old and 7 of a very old sow (molars worn to the sockets).

I am of Nehring's opinion, that the pigs from Calamianes and Palawan are somewhat dwarfy varieties of the Bornean *Sus barbatus*, and the same holds good with regard to the Balabac pig. In the table of cranial measurements given below the reduced measurements of *S. barbatus balabacensis* are placed side by side with the same of *S. barb. palavensis*; these last are calculated from the absolute measurements given by Nehring ||; for comparison have been added the measurements of a male and female skull of *S. barbatus*, reduced as above from the tables in Nehring's paper ¶.

* A. Nehring, "Ueber *Sus celebensis* und Verwandte," l. c. pp. 22, 32; id. Sitzungsber. naturf. Fr. Berlin, 1890, p. 11.

† "Etude sur les Suilliens," l. c. t. ii. 1888, pl. xvii. fig. 4; 1892, pl. xx. B. fig. 3, pl. xxix. C. fig. 7; 1894, p. 221, pl. xl. figs. 1, 2, 5.

‡ Sitzungsber. naturf. Freunde Berlin, 1894, pp. 190, 220.

§ L. c. p. 191. See also Nehring, "Ueber die javanischen Wildschwein-Arten," &c. (Zoolog. Garten, xxxvi. 1895, p. 46).

|| "Ueber *Sus celebensis* und Verwandte," p. 32; Sitzungsber. Ges. naturf. Fr. 1894, p. 221.

¶ "Ueber *Sus celebensis*," p. 32.

Skull measurements.	<i>S. verrucosus mindanensis</i> , Maj. B.M. 91.11.33.2 ♂.	<i>S. verrucosus amboinensis</i> , Maj. B.M. 59.8.4.6. (1932 c.) ♂.	<i>S. verrucosus amboinensis</i> , Maj. B.M. 59.8.4.5. (1932 d.) ♂.	<i>S. verrucosus ceramensis</i> , Gray. B.M. 702 d. ♂.	<i>S. verrucosus borneensis</i> , Maj. B.M. 59.11.5. (1932 e.) ♂.	<i>S. barbatus balabacensis</i> , Maj.			
						B.M. 94.6.8.8. ♂.	B.M. 94.6.8.9. ♀.	B.M. 94.6.8.7. ♀.	B.M. 94.6.8.10. ♀ juv.
1. Basal length of cranium	269	270	268	330	325	313	288	307	285
2. Profile length (from occip. crest to ant. end of intermax.)	319	330	334	396	388	360	346	353	301
3. Length from foram. magn. to post. end of vomer	43	46	44	59	53	43.5	38	42	39
4. Length from foram. magn. to back of palate (middle line) ..	75	72	74	86.5	80	68	62	68.5	62
4 a. Length from back of palate to ant. end of intermax.	194	198.5	194	241	241	245	236	238.5	206
4 b. Length of molar region of palate	124.5	133.5	134.5	173	171	177.5	166	170.5	146
4 c. Length of incisor region of palate	72	65.5	61.5	69	70	69	61	68.5	59
5. Length of intermaxilla at alveolar margin	71	65	61	68	65	69	63.5	71	59.5
6. Width of cranium at largest (between zygom. arches)	130	142	147	153	174	125	123.5	134.5	112.6
7. Frontal breadth between post-orbital processes	88	9	98	93	100	90.5	88	93	83
8. Frontal breadth at narrowest (between upper lacr. sutures) ..	59	63	73	66	74	61.5	60	64.2	53
9. Breadth at largest between occipital also	71	81	....	....	87	60	62	60	57.5

10. Width of nasals between post. ends of internax.	25.5	27	29.5	24.5	31	28	28.5	31	25.5
11. Palatal breadth between ant. part of m. 3.	23	21	25.5	24	33	22	27	21	21
12. Palatal breadth between ant. part of m. 1.	26	27.5	29	28	29	24.5	28.5	29.5	24.5
13. Palatal breadth between ant. part of p. 3.	32.5	35	34.5	37.5	ca. 42	30.5	35.5	35.5	28.5
14. Breadth of snout directly above p. 3.	46	47	49	53	54	45	47	48.5	40
15. Height of occiput from lower margin of for. magn.	107.5	119	121	134	135	104	98	103.5	90
16. Height of skull when resting on mandibula.	170	205	216	209	220	180	177	182	170
17. Length of nasals (middle line).	164	183	155	195	....	166	155	....	139
18 a. Length of palatine bone behind m. 3 (middle line)	4-5	11.5	16.5	18.5	25.5	32	29	29	17.5
18 c. From nasals to middle of a line drawn between postorb. proc.	65.5	60.5	63.5	82	....	95	90	....	80.5
19 a. From same "frontal line" to middle of occipital crest	86	106	110	109	103.5	92	95.5	91	80
20. Joint length of upper molars and premolars.	93.5	96	94	124	108	113	108	112.5	107
27. Length of upper m. 3.	24	26	25	36	32	29	27	30	25.5
22. Length of horizontal mandibular ramus from post. end of m. 3.	165	162	159	204	191.5	190	175	185	167
23. Breadth of mandibula at largest (between condyles)	110	123	....	....	139	104.5	104.5	109.5	94
36. Length of lower m. 3.	96.5	27	27	39.5	37	33	31.5	37.5	30

Cranial percentages.	<i>S. verrucosus mindanensis</i> , Maj. B.M. 91.11.58.3. ♂.	<i>S. verrucosus philippensis</i> , Nehr. Z. M. Dresden 1138. ♂.		<i>S. verrucosus amboinensis</i> , Maj. B.M. 59.4.4.5. 1952 c. ♂.		<i>S. verrucosus celebensis</i> , Av. of 6 skulls. ♂.	<i>S. verrucosus ceramensis</i> , Gray. B.M. 702 d. ♂.	<i>S. verrucosus borneensis</i> , Maj. B.M. 59.3.16.5. ♂.	<i>S. verrucosus Java</i> , Av. of 4 skulls.
		♂.	♂.	♂.	♂.				
1. Basal length of cranium	100	100	100	100	100	100	100	100	100
2. Profile length of cranium	118.5	121.6	117.8	122.2	124.6	120.8	120	120.7	122.8
3. Length from for. magn. to post. end of vomer	16	16.6	15.87	17	16.4	17	17.9	16.5	17.3
4. Length from for. magn. to back of palate (middle line)	28	27	27	26.7	27.6	26.82	26.2	24.9	26.17
4 a. Length from back of palat. to ant. end of intermax.	72.1	....	....	78.5	72.4	....	73.3	75.3	....
4 b. Length of molar region of palate ..	46.3	....	....	49.4	50.2	....	52.4	53.2	....
4 c. Length of incisor region of palate ..	26.8	....	....	24.3	22.9	....	20.9	21.8	....
5. Length of intermaxilla at alveolar margin	26.4	24.7	23.8	24.1	22.8	23.53	20.8	20.2	21.64
5. Width of cranium at largest (between zygion. arches)	48.3	52.5	51.2	52.6	54.8	53.77	46.4	54.1	49.77
6. Frontal breadth between postorbital processes	33.7	34.7	33.7	33.7	36.6	35.31	28.2	31.1	29.75
7. Frontal breadth at narrowest (between upper lechr. suture)	22	23.16	22.2	23.33	27.2	24.03	20	23	21.35
9. Breadth at largest between occipital ales	26.4	33.2	29.4	30	....	31.03	....	27.1	30.46

10. Width of nasals between post. ends of internax.....	9.5	10	9.13	10	11	10.92	7.4	9.6	8.97
11. Palatal width between ant. part of m. 3.....	8.5	7.9	7.3	7.8	9.5	9.06	7.3	10.3	8.45
12. Palatal width between ant. part of m. 1.....	9.7	10	8.3	10.2	10.8	10.6	8.5	9	9.42
13. Palatal width between ant. part of p. 3.....	12.1	12	11.1	13	12.9	12.73	11.4	ca. 13.1	11.9
14. Breadth of snout directly above p. 3.....	17.1	16.4	15.9	17.4	18.3	17.25	16.1	16.8	16.72
15. Height of occiput from lower margin of for. magn.....	40	45.6	40.5	44.1	45.15	44.8	40.6	42	41.37
16. Height of skull when resting on mandibula.....	63.2	73.36	68.65	75.9	80.6	76.09	63.3	68.4	68.3
18. Length of nasals (middle line).....	61	60.6	57.1	56.7	57.8	57.65	59.1	.....	57.77
18 b. Length of palatine bone behind m. 3 (middle line).....	1.7	.....	.....	4.3	6.2	.....	5.6	8	.....
18 c. From nasals to middle of a line drawn between postorb. processes.....	24.3	.....	.....	22.4	23.7	.....	24.8	.....	.....
18 d. From same "frontal line" to middle of occipital crest.....	32	.....	.....	39.2	41	.....	33	32.2	.....
24. Joint length of upper molars and pre-molars.....	34.8	34.36	36.5	35.55	35.1	34.85	37.6	33.6	35.5
27. Length of upper m. 3.....	8.9	8.5	9.1	9.6	9.3	8.9	10.9	9.95	10.58
32. Length of horizontal mandibular ramus.....	61.3	57.9	57.9	60	59.3	58.07	61.8	.....	60.17
33. Breadth of mandibula at largest (between condyles).....	40.8	44	42.5	45.55	.....	44.97	.....	43.2	41.5
36. Length of lower m. 3.....	9.8	10	9.5	10	10	10.05	12	11.5	12.16

Cranial percentages.	<i>Sus barbatus balabacensis</i> , Maj.				<i>S. barbatus palarensis</i> , Nehr.	<i>S. barbatus palarensis</i> , Nehr.	<i>S. barbatus palarensis</i> , Huet.	<i>S. barbatus</i> , Berlin, 4086.	<i>S. barbatus</i> , Dresden, 4730.
					4472.	Palawan (Paraguas).	♂.	♂.	♀.
	B.M. 94.6.8.3. ♂.	B.M. 94.6.8.9. ♀.	B.M. 94.6.8.7. ♀.	B.M. 94.6.8.10. ♀ jun.					
1. Basal length of cranium	100	100	100	100	100	100	100	100	100
2. Profile length of cranium	115	120.1	116	113.6	116	117.3	113.8	123.1	113.2
3. Length from for. magn. to post. end of vomer	13.9	13.2	13.7	14.7	14.4	....	....	12.7	13.2
4. Length from for. magn. to back of palate (middle line)	21.7	21.5	22.3	23.4	22.45	....	....	21.1	21.1
4 a. Length from back of palate to ant. end of intermax.....	78.3	78.5	77.7	77.4	....	....	....	....	....
4 b. Length of molar region of palate ..	567	57.6	55.5	55.1	....	....	....	....	....
4 c. Length of incisor region of palate ..	22	21.2	22.3	22.3	....	....	....	....	....
5. Length of intermaxilla at alveolar margin	22	22	23.1	22.45	20.35	....	....	20.4	21.9
5. Width of cranium at largest (between zygom. arches)	39.97	42.9	43.8	42.45	42.45	47.5	49.1	40.9	42.7
6. Frontal breadth between postorbital processes	28.9	30.55	30.3	31.3	30.2	....	....	27.1	28.6
7. Frontal breadth at narrowest (between upper lacr. suture)	19.65	20.8	20.2	20	20.7	....	....	18.55	19.1
8. Breadth at largest between occipital also	19.2	21.5	21.5	21.7	21.4	20	20.34	17.33	18.8

10. Width of nasals between post. ends of internax.	8-9	9-9	10-1	9-6	10-2	....	....	9-55	9-55
11. Palatal width between ant. part of m. 3	37	9-4	6-8	7-9	7-7	....	....	6-8	7-2
12. Palatal width between ant. part of m. 1	7-8	9-9	9-6	9-2	7	....	....	8	8-8
13. Palatal width between ant. part of p. 3	9-7	12-3	11-6	10-75	9-5	....	....	10-4	10-1
14. Breadth of snout directly above p. 3	14-4	16-3	15-8	15-1	15-1	....	....	14	15-45
15. Height of occiput from lower margin of for. magn.	33-2	34	33-7	33-96	33-7	....	....	36	33-86
16. Height of skull when resting on mandibula	56-6	61-4	59-3	55-6	64-6	....	....	53-8	63-9
18. Length of nasals (middle line)	53	53-8	....	52-45	52-6	....	....	60-4	53
18 b. Length of palatine bone behind m. 3 (middle line)	10-2	10-1	9-4	6-6	10-2	....	....	14-9	15-17
18 c. From nasals to middle of a line drawn between postorb. processes.	30-35	31-25	....	30-4	....	....	....	....	....
18 d. From same "frontal line" to middle of occipital crest.	29-4	33-15	29-6	30-2	....	....	....	....	....
24. Joint length of upper molars and pre-molars	36-1	37-5	36-6	40-4	36-8	34-1	36-80	30-2	33-4
27. Length of upper m. 3	9-3	9-4	9-8	9-6	9-8	....	....	8-4	9-27
32. Length of horizontal mandibular ramus	60-7	60-8	60-3	63	57-6	....	....	57-8	56-74
33. Breadth of mandibula at largest (between condyles)	3-4	36-3	35-7	35-5	36-8	....	....	33-8	....
36. Length of lower m. 3.	10-5	10-9	12-2	11-3	10-2	....	....	10	11-76

I do not propose to enter here into a detailed description of the differences between the *barbatus* and the *verrucosus* group. It may suffice to point out the greater length in *barbatus* of that part of the upper surface of the cranium situated behind a line connecting the postorbital processes (no. 18 *d* of table of measurements), as well as the superior length, compared with *verrucosus*, of the bony palate of *barbatus* (nos. 4 *a*, 18 *b*), whereas the length between the foramen magnum and posterior end of the vomer is shortened in proportion *. Some variation in this respect occurs in the *verrucosus* group (see measurements). Another point of difference between the two groups, which strikes at once, is the height of the skull (no. 15), even those members of the *verrucosus* group which possess the lowest skull (*mindanensis*—*ceramicus*) remaining considerably above those of the *barbatus* group.

The *barbatus* skull, besides being very elongate—the intermaxilla, however, is relatively short—is also narrow, as compared with *verrucosus* (see nos. 6, 7, 9, 14, 33). As to the width of the cranium, between the zygomatic arches, there occurs a considerable amount of variation in the various members of the *barbatus* group. The female skulls alone would not have justified the separation of the Balabac form from that of Palawan; but in the breadth of the male skulls a considerable difference is to be noticed. The adult male of Palawan †, though having a shorter skull than the male from Balabac—P.=305, B.=313—has a breadth of 145 millim. against 125 as shown by B.; the immature type of "*S. ahambabus*" already surpasses B. in this respect.

S. barb. calamianensis also has a much broader skull than the Balabac form; length of skull from Culion 315, breadth 147 millim. ‡; the same appears from the figure given by Heude §.

Tables are given (pp. 536–541) of measurements to which reference has already been made in the text. The measurements are mostly those used by Nathusius ('Vorstudien') and by Rütimeyer (*l. c.*), with some alterations proposed by Nehring ('Ueber *Sus celebensis* und Verwandte'), to whose tables most of the numbers prefixed refer.

* See Nehring's various papers on "*S. longirostris*," Zool. Anz. 1885, Sitzungsber. Ges. naturf. Fr. 1886; p. 80, as well "Ueber *Sus celebensis* und Verwandte," *l. c.* pp. 18–20; Heude, *l. c.* ii. 1894, p. 221, pl. xi. fig. 5; Nehring, Zool. Garten, xxxvi. 1895, p. 40 and fig. 1.

† Nehring, Sitzungsber. Ges. naturf. Fr. 1894, p. 221.

‡ Nehring, *ibid.* 1894, p. 192.

§ *l. c.* pl. xi. fig. 1.

LV.—On *Lepidoptera Heterocera* from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c.—Part II. Family Geometridæ; Subfamilies *Enochrominæ*, *Orthostixinæ*, *Larentiinæ*, *Acidaliinæ*, and *Geometrinæ*.

Subfamily *ENOCHROMINÆ*.

Genus *SARCINODES*.

(Guen.; Hampson, Fauna Brit. Ind., Moths, iii. p. 315 (1895).)

—*Sarcinodes restitutaria*.

Aurima restitutaria, Walk. Cat. Lep. Het. xxvi. p. 1527 (1862).

Sarcinodes restitutaria, Butl. Ill. Typ. Lep. Het. vi. p. 69, pl. cxv. figs. 1, 2 (1886); Hampson, Fauna Brit. Ind., Moths, iii. p. 315 (1895).

One specimen from Omei-shan: July.

This example is violet-grey, suffused with olive-brown before the transverse line and on outer margins.

Distribution. Sikhim; Khâsis; Sumatra (*Hampson*); Western China.

—*Sarcinodes æquilinaria*.

Mergana æquilinaria, Walk. Cat. Lep. Het. xxi. p. 292 (1860).

Sarcinodes æquilinaria, Butl. Ill. Typ. Lep. Het. vi. p. 69, pl. cxv. figs. 5, 6 (1886); Hampson, Fauna Brit. Ind., Moths, iii. p. 316 (1895).

One male specimen from Omei-shan, taken in July.

Distribution. Sikhim; Khâsis (*Hampson*); Western China.

Genus *PALEOMYSTIS*.

(Warren, Novit. Zool., i. p. 379 (1894).)

—*Paleomystis falcataria*.

Urapteryx (?) *falcataria*, Moore, Proc. Zool. Soc. Lond. 1867, p. 613.

Metrocampa unio, Oberth. Etud. d'Entom. xi. p. 32, pl. vi. fig. 43 (1886); Alph. Rom. sur Léop. vi. p. 58 (1892).

Paleomystis falcataria, Hampson, Fauna Brit. Ind., Moths, iii. p. 318 (1895).

My collectors obtained this species at Ta-chien-lu, Wa-shan, Chia-kou-ho, and Pu-tsu-fong in June and July.

Alphéraky records a specimen from Tchagan, in the Province of Kan-Sou, taken in July.

Distribution. Sikhim (*Hampson*); Western China.

—Palæomystis mabillaria.

Erosia (?) *mabillaria*, Pouj. Ann. Soc. Ent. Fr. 1895, p. 311, pl. vi. fig. 12.

Poujade records a male specimen from Moupin. I have received an example of the same sex from Huang-mu-chang, taken in July, and another from Wa-shan, taken in June.

Hab. Western China.

This species is smaller than *P. falcataria*, Moore, and the angle of the secondaries is more produced.

Subfamily *ORTHOSTIXINÆ*.Genus *IOTAPHORA*.

(Warr. Novit. Zool. i. p. 322 (1894).)

—Iotaphora iridicolor.

Panathia iridicolor, Butl. Ann. & Mag. Nat. Hist. (5) vi. p. 227 (1880); Ill. Typ. Lep. Het. vi. p. 49, pl. cxiii. fig. 3 (1886).

Metrocampa admirabilis, Oberth. Bull. Soc. Ent. Fr. 1883, p. lxxxiv; Etud. d'Entom. x. p. 29, pl. i. fig. 8 (1884).

Metrocampa (?) *admirabilis*, Græser, Berl. ent. Zeit. 1888, p. 392.

Iotaphora iridicolor, Hampson, Fauna Brit. Ind., Moths, iii. p. 322 (1895).

My collectors obtained a specimen in each of the following localities:—Chang-yang, Ichang, Moupin, Wa-shan, Omei-shan: June and July.

Distribution. Sikhim; Khâsis (*Hampson*); Amur; Central and Western China.

All my Chinese examples are larger than any Himalayan specimen that I have seen, and, with the exception of the Wa-shan specimen, they all have a greenish tinge. Græser states that the larva of this species feeds on *Juglans mandschurica*, and that it is like a curled leaf in appearance.

Genus *EUMELEA*.

(Duncan; Hampson, Fauna Brit. Ind., Moths, iii. p. 320 (1895).)

—Eumelia rosalia.

Phalena (Geometra) rosalia, Cram. Pap. Exot. iv. pl. cccxlvi. fig. F (1782).

Eumelea rosalia, Hampson, Fauna Brit. Ind., Moths, iii. p. 320 (1895).

Hampson gives China for this species, probably in the south, as my collectors did not meet with it in any part of Central or Western China that they visited.

Distribution. China; Formosa; throughout India, Ceylon, and Burma; the Malayan and Austro-Malayan subregions.

Genus *NAXA*.

(Walk. ; Hampson, Fauna Brit. Ind., Moths, iii. p. 324 (1895).)

Naxa margaritaria, sp. n.

Frenulum absent; antennæ bipectinated; hind tibiæ not dilated, but with terminal pair of spurs. Subdiaphanous with strong pearly reflections. Traversed by series of black spots as in *N. seriaria*. The subcostal spot of first series is double, and there is an additional one on the inner margin, increasing the number in this series to four; there is also a spot on inner margin between the first and second series. The secondaries also have an additional spot about the middle of the abdominal margin. All the markings are smaller and fainter. Body and upperside of legs black.

Expanse 44-46 millim.

Two male specimens from Chang-yang, July.

Hab. Central China.

— *Naxa seriaria*.

Zerene seriaria, Motsch. Bull. Soc. Nat. Mosc. 1803, pt. 1, p. 103.

Orthotixia latata, Brem. Lep. Ost-Sib. p. 84 (1864).

Zerene taicoumaria, de l'Orza, Cat. Léop. Jap. p. 48.

Naxa seriaria, Hampson, Fauna Brit. Ind., Moths, iii. p. 325 (1895).

Ptilonaxa taicoumaria, Warren, Proc. Zool. Soc. Lond. 1893, p. 393.

There were some specimens in Pryer's collection under the name *Naxa textilis*. In his 'Catalogue of the Lepidoptera of Japan,' Pryer says: "Yokohama. Larva hairy, gregarious. Living in a web; feeds on the privet."

Occurs also in the Island of Kiushiu and at Omei-shan. The specimens from the last-named locality range in expanse from 36-53 millim.

Distribution. Bhután; Nágas (*Hampson*); Amur; Japan; Kiushiu; Western China.

Naxa angustaria, sp. n.

Similar in appearance to *N. seriaria*, Motsch., but the frenulum is present, and the antennæ are shortly bipectinated in both sexes; hind tibiæ not dilated and with terminal spurs. The discal spots of secondaries are smaller; the submarginal series of black spots on each wing is rather nearer the marginal series, and the spots themselves are smaller.

Expanse 40-52 millim.

Several specimens from Ichang and Chang-yang: June and July.

Hab. Central China.

Naxa contraria, sp. n.

Antennæ bipectinated in both sexes. Frenulum present; hind tibiæ much dilated, with short terminal spurs. Arrangement of black spots somewhat similar to that of *N. seriaria*, but there are two additional spots on primaries, one on middle of inner margin, and one between it and the base of the wing; there is also a black spot on the middle of the abdominal margin of secondaries. The marginal spots are not always well formed.

Expanse 50–60 millim.

Eight specimens, from Chang-yang and Ichang, July.

This species differs from *N. margaritaria* in its larger size, stronger pectinations of antennæ, absence of pearly reflection, and presence of frenulum.

Hab. Central China.

— *Naxa montanaria*, sp. n.

Outer margin of secondaries rather straight from middle to anal angle, which is more produced, as also is the apex of primaries. Maculation similar to that of *N. contraria*, but finer and less distinct, and the wings are more transparent.

Expanse, ♂ 58, ♀ 68 millim.

Six male specimens and four females from Omei-shan, one male from Wa-shan, all taken in June.

Hab. Western China.

— *Naxa obliquaria*, sp. n.

Antennæ finely serrated in both sexes. Frenulum present; hind tibiæ much dilated. Apex of primaries rather acute. Greyish white. All the wings have a blackish discal spot and an oblique blackish line outwardly bordered with white and angled towards costa of primaries. Fringes silky white, preceded by a series of black spots. Under surface silky white; discal spots black and conspicuous; the apices of primaries black, and there is a spot of the same colour at outer angle of secondaries; fringes preceded by black spots as above.

Expanse 42–46 millim.

A male specimen from Chow-pin-sa, June, and one example of each sex from Omei-shan, July.

Hab. Western China.

— Genus *EMMECOSMIA*.

(Warren, Novit. Zool. iii. p. 118 (1896).)

— *Emmecosmia bilinearia*, sp. n.

Pale whitish brown or ochreous brown. Primaries have two

parallel dark ochreous-brown transverse lines, the first commencing in a blackish spot on costa and passing very close to the blackish discal spot; excision below apex is marked with dusky; costal and outer marginal areas suffused with greyish brown. Secondaries have a dusky transverse line beyond the middle. Fringes of the ground-colour, tinged with darker on primaries. Under surface ochreous, except on inner half of primaries; all the wings have a dusky transverse line beyond the middle.

Expanse 85-42 millim.

Eight female specimens were taken by a native collector to the north of Ta-chien-lu.

Hab. Western China.

Subfamily LARENTIINÆ.

Genus LEPTOSTEGNA.

(Christ. Bull. Soc. Nat. Mosc. lv. 2, p. 86 (1880).)

—*Leptostegna tenerata*.

Leptostegna tenerata, Christ. Bull. Soc. Nat. Mosc. lv. (2) p. 88 (1881); Hampson, Fauna Brit. Ind., Moths, iii. p. 333 (1895).

Several specimens in Pryer's collection from Oiwake, Yesso, and Nikko.

I captured examples at Gensan in June, and have received it from Hakodate, also from Chang-yang, Wa-shan, Ta-chien-lu, Pu-tsu-fong, and Chia-kou-ho.

Distribution. Amur; Japan; Yesso; Corea; Central and Western China; Sikhim.

Genus NAXIDIA.

(Hampson, Fauna Brit. Ind., Moths, iii. p. 334 (1895).)

—*Naxidia punctata*.

Argidava punctata, Butl. Ann. & Mag. Nat. Hist. (5) vi. p. 128 (1880); Ill. Typ. Lep. Hel. vi. p. 67, pl. cxvii. fig. 1.

Naxidia punctata, Hampson, Fauna Brit. Ind., Moths, iii. p. 334 (1895).

Appears to have been common at Wa-shan, and was also obtained at several of the other localities in Western China visited by my collectors.

Distribution. Sikhim; Nágas (*Hampson*); Western China.

—*Naxidia irrorata*.

Argidava irrorata, Moore, Lep. Atk. p. 251 (1887).

Naxidia irrorata, Hampson, Fauna Brit. Ind., Moths, iii. p. 334 (1895).

One female specimen from Ta-chien-lu, taken in June, I have referred to this species, but, as I have not seen the type,

I am not quite certain that the identification is correct. However, the specimen agrees with the description of *N. irrorata*.

Distribution. Sikkim; Nágas (*Hampson*); Western China.

Naxidia maculata.

Argidava maculata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 373 (1879).

There was a nice series in Pryer's collection, some of the specimens labelled "Oiwake." Referring to this species in his 'Catalogue of the Lepidoptera of Japan,' Pryer says, "It mimics *Æmene fasciata*, and is found in the same localities at rest on stones." He gives Ohoyama and Nikko as localities.

Hab. Japan.

— Genus *LYGRANOEA*.

(Butler, Ann. & Mag. Nat. Hist. (5) i. p. 402 (1878).)

— *Lygranoea fusca.*

Lygranoea fusca, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 447 (1878); Ill. Typ. Lep. Het. iii. p. 54, pl. liv. fig. 7 (1879).

A series from Ohoyama and Nikko in Pryer's collection. I met with the species at Gensan in June, and I have received it from Ningpo and from localities in Central and Western China. It occurs in June, July, and August. Grässer records a male specimen from Wladivostock.

Distribution. Amur; Japan; Corea; Eastern, Central, and Western China.

— *Lygranoea sinuosaria*, sp. n.

Primaries brownish, darker on basal and outer marginal areas; subbasal line blackish, oblique, angled above submedian nervure; about the middle of costa there is a black triangular spot, its apex almost touching the black, elongate discal spot; beyond the middle of costa is another black spot somewhat quadrate in form, from the lower outer corner of this spot a black sinuous line forms an acute angle and continues to inner margin; submarginal line whitish, wavy, preceded on costa by a diffuse blackish spot. Secondaries whity brown, suffused with fuscous, and with indications of a dusky central line. Fringes of primaries brownish, marked with darker, and of secondaries pale brown. Under surface pale brown, whitish on inner marginal area of primaries; all the wings have a fuscous transverse line beyond the middle marked with blackish on the venation, and the primaries have an elongate discal spot.

Expanse 38 millim.

One male specimen from Ta-chien-lu, July.

Hab. Western China.

This species is allied to "*Dysethia*" *bicommata*, Warren.

—*Lygranoa grisearia*, sp. n.

Primaries grey, with two velvety-black spots on the costa; below the first there is an ill-defined transverse line, marked with black on the median nervure and again on inner margin; the lower end of the second spot is produced outwards, and from the extremity of this projection there is a series of black points on the venation; submarginal line pale, wavy, intersecting a brownish shade on the outer marginal area; there is also a brownish transverse shade on the median area; discal dot black. Secondaries greyish, with a punctiform central line. Fringes: primaries greyish brown; secondaries greyish, marked with darker at the ends of the nervules; preceded on all the wings by a dusky crenulate line. Under surface ochreous brown, powdered and suffused with darker brown; all the wings have an elongate blackish discal spot and indication of a transverse line beyond; fringes brownish.

Expanse 38 millim.

One female specimen from Pu-tsu-fong and one from Kia-ting-fu: June.

Hab. Western China.

Lygranoa pallescens.

Dysethia pallescens, Warren, Novit. Zool. iii. p. 118 (1896).

Four female specimens in Pryer's collection. Three of these are from Oiwake, but the fourth, which is suffused with brownish on the margins, is not localized.

Hab. Japan.

Genus CRYPTOLORA.

(Warren; Hampson, Fauna Brit. Ind., Moths, iii. p. 336 (1895).)

—*Cryptoloba cinerea*.

Lygranoa cinerea, Butl. Ann. & Mag. Nat. Hist. (5) vi. p. 228 (1880); Ill. Typ. Lep. Hist. vi. p. 86, pl. cxx. fig. 4 (1886).

Cryptoloba cinerea, Hampson, Fauna Brit. Ind., Moths, iii. p. 337 (1895).

Five specimens (4 ♂, 1 ♀) from Chang-yang, Central China: July.

Distribution. Central China; Dharmasala; Sikhim.

Cryptoloba rivularia, sp. n.

Primaries black, traversed by four white lines; the first is not well defined, the second is serrated and sharply dentate above inner margin, the third is serrated and angled below costa, the fourth is macular below costa. Secondaries white, clouded with blackish at the base and on outer margin; discal spot is black, and there are indications of a blackish central band. Fringes of primaries black and white; of secondaries white, preceded by a black line. Under surface white; primaries have the costa streaked with black from base to a short angulated band; the outer margin is broadly black, intersected by a white macular line; secondaries have a black discal spot, interrupted central band, and outer marginal border, the latter intersected by a white macular line.

Expanse 24–26 millim.

Five male specimens, from Omei-shan, Ni-tou, Che-tou, Pu-tau-fong: June and July.

Hab. Western China.

Allied to *C. frigida*, Butl., but the lobe at base of secondaries is much smaller.

Cryptoloba frigida.

Coremia frigida, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 450 (1878); Ill. Typ. Lep. Het. iii. p. 56, pl. lv. fig. 3 (1879).

A long series from Yokohama in Pryer's collection.

Hab. Japan.

Genus LOBOGONIA.

(Warren, Proc. Zool. Soc. Lond. 1893, p. 345.)

Lobogonia parallelaria, sp. n.

Pale brown, irrorated with darker, especially on the secondaries. Primaries traversed by two oblique, parallel, dark brown lines, each of which expands on the costa; there is a dark brown spot on costa before apex, and one below between veins 5 and 6; fringes almost black, except at the angle. Secondaries have a discal dot and sharply-curved transverse line, both dusky; fringes ochreous, preceded by a dark brown line. Under surface: of primaries smoky grey, costa and on outer margin ochreous; of secondaries ochreous, irrorated with brownish; markings on all wings similar to above, but the first line of primaries is less, and that of secondaries more, distinct.

Expanse 32 millim.

One specimen from Ichang, June.

Hab. Central China.

Lobogonia ambusta.

Lobogonia ambusta, Warren, Proc. Zool. Soc. Lond. 1893, p. 346, pl. xxxi. fig. 21.

Several specimens received from Pu-tsu-fong and Omei-shan, where they were taken in July.

Distribution. Khásis (*Hampson*); Western China.

Lobogonia conspicuaria, sp. n.

Differs from *L. ambusta*, Warren, in having the first and second black spots on costa of primaries larger and triangular in shape, the apex of the second extends to the enlarged spot beyond the middle of the outer transverse line; the lines originating in these spots are not clearly defined. On the secondaries the central line is broader. Fringes blackish above and below the angle of each wing.

A nice series, including both sexes, was taken at Chang-yang in July.

Hab. Central China.

Nearly allied to *L. pseudomacariata*, Poujade.

— *Lobogonia pseudomacariata.*

Eltopia pseudomacariata, Pouj. Ann. Soc. Ent. Fr. 1895, p. 308, pl. vi. fig. 4.

Poujade records one female specimen from Moupin; my collectors did not meet with the species.

Hab. Western China.

Lobogonia fasciaria, sp. n.

Primaries olive-yellow, sparingly freckled with olive-brown, and traversed by two bands of the same colour; the first band is slightly contracted below the middle, and the second both above and below the middle; there are two olive-brown spots on costa near apex, two others above angle on outer margin, and a linear one towards inner angle. Secondaries much paler, freckled with fuscous, and traversed by a fuscous central line; discal dot blackish. Fringes blackish, except at apex and angle of primaries. Under surface paler than above: primaries suffused with dusky on basal area; all the wings have a dusky central line.

Expanse 27 millim.

Two female specimens from Chang-yang: June, July.

Hab. Central China.

Genus CARIGE.

(Walk. Cat. Lep. Het. xxvi. p. 1631 (1862).)

- *Carige cruciplaga*.*Macaria cruciplaga*, Walk. Cat. Lep. Het. xxiii. p. 937 (1861).*Carige duplicaria*, Walk. *op. cit.* xxvi. p. 1632 (1862).*Macaria nigronotaria*, Brem. Lep. Ost-Sib. p. 80, pl. vii. fig. 6 (1864).*Macaria indictinaria*, Brem. *l. c.* p. 81, pl. vii. fig. 8.

This variable species seems to be generally distributed throughout Western China, and is common in Japan and Corea.

It also occurs at Chang-yang, Central China, but as the form from this locality is rather different to either of those previously named, I describe it as

- Var. *extremaria*.

Apex of primaries more produced and the outer margin of secondaries more deeply indented. Larger in expanse. More thickly powdered with fuscous, and the markings are much larger and blacker.

Expanse, ♂ 38, ♀ 42 millim.

Two examples of each sex.

Distribution. Siberia; Sikhim; Khâsis; Penang (*Hampson*); Japan; Central and Western China.

Meyrick (*Trans. Ent. Soc.* 1892, p. 91) places *duplicaria*, Walk. (*nigronotaria*, Brem.) in *Calothyasis*, Hübn.

- *Carige flavidaria*, sp. n.

Somewhat similar to *C. cruciplaga*, but the median nervure and its branches and the nervules above are broadly ochreous; the double black lines are interrupted, except at costa and towards inner margin, and the yellow bands between are broader and deeper in colour; all the wings have a pale sub-marginal line, but serrated; the inner double line of primaries is nearer to the black discal dot. The same differences are noticeable on the under surface.

Expanse 40 millim.

One male specimen from Omei-shan, July.

Hab. Western China.

Genus ANAITIS.

(Dup.; Hampson, *Fauna Brit. Ind.*, Moths, iii. p. 341 (1895).)- *Anaitis plagiata*.

Phalæna-Geometra plagiata, Linn. *Syst. Nat.* i. p. 809.

Anaitis plagiata, Dup. Lép. v. p. 532, pl. cxv. figs. 2, 3; Hampson, Fauna Brit. Ind., Moths, iii. p. 342.

Eucetia plagiata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 69.

Two female specimens of the first brood, and one male and two females of the second brood, from Oiwake, Nikko, and Ohoyama, in Pryer's collection.

The examples of first brood in Japan are paler, and those of second brood darker than European specimens.

Distribution. Europe; Asia Minor; Japan; Afghanistan; N.W. Himalayas (*Hampson*).

—*Anaitis pudicata*.

Anaitis pudicata, Guen. Phal. ii. p. 497 (1857); Hampson, Fauna Brit. Ind., Moths, iii. p. 341 (1895).

Appears to be common at Chia-ting-fu, Moupin, Wanshan, Pu-tsu-fong, Ichang, and Chang-yang: June and July.

In the Chinese specimens of this species the postmedial line is not excurved beyond end of cell, but is nearly straight from costa to inner margin.

Distribution. Afghanistan; N.W. Himalayas; Sikhim (*Hampson*); Western and Central China.

—*Anaitis brunnearia*, sp. n.

Primaries greyish brown, traversed by two pale lines; the first is nearly straight from subcostal to inner margin, and is bordered outwardly with brownish; the second is oblique from costa to inner margin, slightly curved about middle, and bordered inwardly with brownish. Secondaries whitish, slightly tinged with crimson. Under surface greyish, suffused with crimson on costal and apical areas of primaries and on discal area of secondaries.

Expanse 40 millim.

One male specimen from Pu-tsu-fong, June.

Hab. Western China.

Closely allied to *A. pudicata*, Guen., but the primaries are not suffused with crimson on costal and outer series above, and on the under surface this colour extends further along outer margin.

—*Anaitis fulgurata*.

Anaitis fulgurata, Guen. Phal. ii. p. 498 (1857); Hampson, Fauna Brit. Ind., Moths, iii. p. 342 (1895).

Orsonoba (?) *medmaria*, Walk. Cat. Lep. Het. xxvi. p. 1521 (1862).

Docirava medmaria, Butl. Ill. Typ. Lep. Het. vi. p. 87, pl. cxx. fig. 6 (1886).

One male specimen from Chia-ting-fu and one from Wanshan: June and July.

Distribution. N.W. Himalayas; Sikhim (Hampson); Western China.

— Genus *SIONA*.

(Dup. Lép. iv. p. 102.)

— *Siona naseraria*.

Siona naseraria, Oberth. Etud. d'Entom. xviii. p. 34, pl. v. fig. 72 (1893).

A nice series, composed of specimens taken at Ta-chien-lu and How-kow in June and July.

Hab. Western China and Thibet.

I have left this species in *Siona*, as placed by Oberthür, but a new genus will probably have to be made for it.

Genus *EUBOLIA*.

(Dup.; Hampson, Fauna Brit. Ind., Moths, iii. p. 343 (1895).)

— *Eubolia duplicata*.

Ortholitha duplicata, Warren, Proc. Zool. Soc. Lond. 1893, p. 385.

Eubolia duplicata, Hampson, Fauna Brit. Ind., Moths, iii. p. 343 (1895).

Several specimens from How-kow, Thibet, and a few examples from Ta-chien-lu, Pu-tsu-fong, and Kia-ting-fu: June and July.

The oblique white medial band varies in width; in two specimens it is almost entirely absent, and the black markings are united forming a large triangular blotch.

Distribution. Chumbi (Hampson); Thibet; Western China.

— *Eubolia similaria*, sp. n.

Allied to *E. peribolata*, Hübn., from Europe, but larger; the outer edge of the central band of primaries is bilobed, and between the inner edge of the band and the base of the wing there are several transverse lines. Secondaries whitish, tinged with fuscous along the basal portion of the abdominal margin; there are indications of a discal spot and central line. Under surface similar to that of *E. peribolata*.

Expanse 38 millim.

Several specimens of each sex from Ta-chien-lu, Wa-shan, and Ni-tou: May and June.

Hab. Western China.

Peribolata, Hübn., is included in *Xanthorhos*, Hübn., by Meyrick (Trans. Ent. Soc. 1892, p. 77).

Genus SCOTOSIA.

(Steph. ; Hampson, Fauna Brit. Ind., Moths, iii. p. 344 (1895).)

Scotosia vashti.

Collix vashti, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 445 (1878) ; Ill. Typ. Lep. Het. iii. p. 52, pl. liv. fig. 3 (1879).

Eucosmia Christophi, Hedem. Horæ Soc. Ent. Ross. xvi. p. 265 (249 bis), pl. xiii. fig. 4 (1881).

Three specimens from Yesso in Pryer's collection.

I obtained several examples at Hakodate in August, and my collectors found the species at several localities in Western China in July.

The Chinese specimens are rather larger than the Japanese examples, and they have a white edging to the costal portion of the outer line of primaries.

Distribution. Amur ; Japan ; Yesso ; Western China.

Christophi, Hedem., is included in *Calocalpe*, Hübner, by Meyrick (Trans. Ent. Soc. 1892, p. 70).

Scotosia multilinearia, sp. n.

Male.—Primaries dark grey, traversed by numerous fuliginous wavy lines; the central area is rather darker and its outer edge is sometimes marked by a white macular line; outer marginal fourth fuliginous, traversed by a macular white line, but this is not distinct throughout. Secondaries fuliginous, with indications of a pale submarginal line. Under surface fuliginous, with a black discal dot on each wing.

Female.—Similar to the male, but the central area is not darker; sometimes there is a pale patch about the middle of the costa enclosing a dark cloud.

Expanse, ♂ 46, ♀ 50 millim.

Two male specimens and ten females from Ta-chien-lu and Che-tou : June and July.

Hab. Western China.

Scotosia bipunctularia, sp. n.

Whity brown, traversed by numerous dark grey-brown wavy lines. On the costa of primaries there are two quadrate blackish spots, and the transverse lines originating from the outer one are slightly more conspicuous than the others. Fringes of the ground-colour chequered with darker. Under surface pale grey, with the transverse lines of upper surface faintly reproduced.

Expanse, ♂ 32, ♀ 34 millim.

Several examples of both sexes from Omei-shan, Ta-chien-lu, Ni-tou, and Chang-yang: July and August.

Hab. Central and Western China.

Closely allied to *S. vetulata*, Schiff., from Europe. The male has a trifid anal tuft.

Scotosia corrugata.

Scotosia corrugata, Butl. Ann. & Mag. Nat. Hist. (5) xiii. p. 275 (1884)

There was a nice series from Yesso in Pryer's collection.

My native collector obtained a specimen at Hakodate and one at Ningpo in June; the latter agrees in colour with *S. vetulata* from Europe.

Distribution. Japan; Yesso; Eastern China.

Scotosia rhamnata.

Geometra rhamnata, Schiff. Wien. Verz. 109; Hübn. Geom. pl. lii. fig. 271.

Philereme rhamnata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 70.

Scotosia rhamnata, var. *japanaria*, Leech, Entom., Suppl. p. 53 (May 1891).

There were two male specimens from Oiwake in Pryer's collection.

The Japanese form of this species differs from the European type in being larger and having a pale grey-brown coloration; the transverse lines are identical in number and form, but the space between the two central angulated lines is not darker. On the under surface the difference of colour is not so pronounced and the markings are typical.

Expanse 40 millim.

Distribution. Europe; Armenia; Japan.

Scotosia dubitata.

Phal. Geometra dubitata, Linn. Syst. Nat. i. 2, p. 866; Clerck, Icon. pl. vi. fig. 2.

Scotosia dubitata, Guen. Phal. ii. p. 445.

Hydriomena dubitata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 72.

Some specimens from Yesso in Pryer's collection.

I have received several examples from Chang-yang and the province of Kwei-chow: June.

Distribution. Europe; Japan; Central and Western China.

Both Japanese and Chinese examples of this species are paler and less distinctly marked, agreeing more nearly with var. *cinereata*, Steph., than with the type.

S. (Thriphosa) Oberthüri, Hedem., from Amurland (Hors. Soc. Ent. Ross. xvi. p. 248 bis), is probably a form of this species.

Scotosia sericata.

Scotosia sericata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 444 (1879).

Five specimens from Yokohama in Pryer's collection.

I received six specimens from the province of Kwei-chow and one from Ichang: June.

The Chinese specimens are rather paler in colour than those from Japan.

Distribution. Japan; Central and Western China.

Scotosia rubrodotata.

Scotosia rubrodotata, Walk. Cat. Lep. Het. xxv. p. 1353 (1862).

Several specimens from the province of Kwei-chow, June and July.

Distribution. Northern India; Western China.

Scotosia expansa.

Scotosia expansa, Moore, Lep. Atk. p. 274 (1887).

Scotosia rubrodotata, Hampson, Fauna Brit. Ind., Moths, iii. p. 345 (1895).

Three specimens from Pu-tsu-fong, June and July.

Distribution. Sikkim; Western China.

Scotosia fasciaria, sp. n.

Male.—Pale greyish brown. Primaries have a blackish-grey basal patch and central fascia; the median portion of the costal half of the fascia is of the ground-colour and encloses the small blackish discal spot, its internal edge is slightly indented below the costa and has a small inward projection towards inner margin, its external edge is dentate below costa, then bilobed about the middle and again towards inner margin; submarginal line pale, edged inwardly with dusky but not clearly defined. Secondaries have the basal area dusky, limited by a rather darker wavy line, and there are slight indications of some dusky transverse wavy lines beyond. Fringes of the ground-colour marked with darker. Under surface pale greyish brown; basal area of each wing dusky; discal spot black; there is a patch of long, silky, brownish-grey hairs on the middle of submedian nervure.

Expanse 44 millim.

One male specimen from Che-tou, July.

Hab. Western China.

*Scotosia certata.**Geometra cervinata*, Hübn. Geom. pl. li. fig. 266.*Pterocymia certata*, Hübn. Verz. Schmett. p. 332.*Scotosia certata*, Guen. Phal. ii. p. 448.*Calocalpe certata*, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 70.*Eucosmia varia*, Hedem. Horæ Soc. Ent. Ross. xvi. p. 55, pl. x. fig. 7 (1879).*Eucosmia varia*, var. *hedemannaria*, Oberth. Etud. d'Entom. v. p. 55, pl. iv. fig. 10 (1880).*Eucosmia exultata*, Christ. Stett. ent. Zeit. liv. p. 35 (1893).

Three specimens, taken at Hakodate by my native collector in July, are referable to *E. varia*, Hedem., which I consider to be simply a well-marked form of *Scotosia certata*. I have very similar examples in my series of this species from Europe.

I received one male specimen from Ichang. This has the central fascia of primaries well defined, the inner edge rather deeply indented towards costa, and the outer edge more than usually dentate. There is a specimen very like this in the series of *S. certata* from Japan in the National Collection.

Distribution. Europe; Amur; Askold; Japan; Yesso; Central China.

Scotosia grisearia, sp. n.

Whitish grey. Primaries have a dark grey basal patch, central fascia, and outer marginal border; the fascia has the median area of the ground-colour, and the marginal border is diffuse and intersected by a whitish wavy line, which develops into a spot above inner angle and sometimes towards costa. Secondaries are suffused with dark grey and traversed by faint wavy lines of the same colour; submarginal line whitish, wavy. Fringes grey, marked with paler, and preceded by a blackish line. Under surface whitish grey; basal two thirds of primaries suffused with fuliginous grey, the outer edge somewhat acutely angulated below costa; discal spot black, elongate, preceded by a blackish rather wavy line; apical area fuliginous grey: secondaries have a black discal spot and a dusky, wavy, central line; there is a patch of long silky dark grey hairs from middle of submedian nervure in the male.

Expanse, ♂ 48, ♀ 50 millim.

Several specimens from Che-tou, Moupin, Ta-chien-lu, and Omei-shan: July and August.

Hab. Western China.

In some of the examples the ground-colour is tinged with ochreous.

Scotosia sideritaria.

Scotosia sideritaria, Oberth. Etud. d'Entom. x. p. 34, pl. l. fig. 13 (1884).

? *Eucosmia alternata*, Staud. Iris, viii. p. 332 (Jan. 1896).

Eucosmia alternata, var. *fusciata*, Staud. l. c.

I have a large number of specimens from Ta-chien-lu, Pu-tsu-fong, Wa-shan, Omei-shan, and Ni-tou: June and July.

In one specimen from Ta-chien-lu the ground-colour is tinged with fulvous; this is similar to a form of *S. dubiosata* in the National collection.

Distribution. Western China; North-east Thibet.

This species very strongly resembles *S. dubiosata*, but the male has a fringe of long hair on vein 1 of hind wing below.

Scotosia undulata.

Phal.-Geometra undulata, Linn. Syst. Nat. x. 524; Clerck, Icon. pl. vi. fig. 3.

Geometra undulata, Hüb. Geom. fig. 262.

Calocalpe undulata, Hüb. Verz. Schmett. p. 330; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 70.

Scotosia undulata, Guen. Phal. ii. p. 449.

Some fine specimens from Oiwake in Pryer's collection.

Distribution. Europe; Altai; Amur; Japan.

—*Scotosia marmoraria*, sp. n.

Primaries fuliginous grey; basal area traversed by two indistinct wavy whitish lines; beyond the black discal spot there is an irregular white patch connected with a macular white band from the costa, outer marginal area limited by a white wavy band, which is traversed by two sinuous dark lines; submarginal line represented by white dots expanding into small blotches about middle and before outer angle. Secondaries white, clouded with grey on the abdominal area; wavy central line and two patches on outer marginal area fuliginous grey, the latter connected by indistinct sinuous lines of the same colour. Fringes dark grey marked with white. Under surface: primaries fuliginous, with white central patch and outer band as above; secondaries white, with an interrupted grey central line and markings as above. The underside of the body and legs ochreous, and the base of all the wings and also abdominal area of secondaries are tinged with the same colour.

Expanse 46-48 millim.

Four male specimens and two females from Omei-shan,

Pu-tsu-fong, Wa-shan, Ni-tou, and Chang-yang : June and July.

Hab. Central and Western China.

Scotonia latifasciaria.

Melanthia latifasciaria, Leech, Entom., Suppl. p. 58 (May 1891).

There were three specimens from Oiwake in Pryer's collection. I have also received the species from Mr. Manley, of Yokohama.

Hab. Japan.

— *Scotosia interruptaria*, sp. n.

White, with black markings. Primaries have the basal area black and divided into two portions by a transverse line of the ground-colour, the outer portion is interrupted; central fascia indicated by the discal spot, connected with a cloud on the costa, a spot on first median fork, and two short bars on inner margin; submarginal band represented by a spot on costa and a smaller one on the nervules; outer marginal band divided by a transverse white line, the inner portion interrupted. Secondaries have a discal spot, a short interrupted band from middle of abdominal margin, a submarginal band represented by dots between costa and second median nervule, and a series of large spots on the outer margin. Fringes black on primaries; black and white on secondaries. Under surface as above. Abdomen is marked with yellow.

Expanse 42 millim.

One male specimen from Ni-tou, and one from Pu-tsu-fong : July.

Hab. Western China.

This species very strongly resembles the figure in Schrenck's "Amurlande" of *Zerene flavipedaria*, Mén. (Lep. pl. v. fig. 11.)

— *Scotosia seseraria.*

Scotosia seseraria, Oberth. Etud. d'Entom. xviii. p. 37, pl. v. fig. 71 (1893).

This species was discovered by R. P. Dejean at Ta-Tsien-Lou. My collectors did not meet with it.

Hab. Western China.

— *Scotosia largeteauaria.*

Eucormia largeteauaria, Oberth. Etud. d'Entom. vi. p. 19, pl. ix. fig. 8 (1881).

Oberthür records this species from Kouy-Tchéou (Kwei

chow). I have received it from the same province, and also from Pu-tsu-fong and Wa-shan : June and July.

Hab. Western China.

Genus PHIBALAPTERYX.

(Stephens ; Hampson, Fauna Brit. Ind., Moths, iii. p. 346 (1895).)

Phibalapteryx tersata.

Geometra tersata, Hübn. Geom. fig. 268.

Phibalapteryx tersata, Steph. Ill. Brit. Ent., Haust. iii. p. 256 ; Guen.

Phal. ii. p. 432.

Eucymatoge tersata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 68.

Phibalapteryx tetricata, Guen. l. c.

Several specimens from Oiwake in Pryer's collection.

The Japanese examples of *P. tersata* more nearly approach var. *tetricata*, Guen., than the type form, but they are not quite identical with either.

Var. *chinensis*, nov.

Smaller than typical specimens and rather redder in colour ; less striated with white, and the submarginal white line is much obscured ; there is a dusky shade before the second line of primaries and also one before the submarginal line, the latter is connected with an oblique streak from apex.

Expanse 30 millim.

One male specimen from Chang-yang, August.

Distribution. Europe ; Altai ; Amur ; Japan ; Central China.

— *Phibalapteryx vitalbata*.

Geometra vitalbata, Hübn. Geom. fig. 269.

Phibalapteryx vitalbata, Steph. Ill. Brit. Ent., Haust. iii. p. 256 ; Guen.

Phal. ii. p. 437.

Eucymatoge vitalbata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 68.

Specimens from Oiwake in Pryer's collection.

I received one example from Ta-chien-lu, taken in May or June.

Distribution. Europe ; Amur ; Japan ; Western China.

Phibalapteryx umbraria.

Scotosia umbraria, Leech, Entom., Suppl. p. 53 (May 1891).

Superficially resembles *Scotosia rhamnata*, but it is larger in size and has an oblique cloud-like central fascia most conspicuous in the male ; in the female the costal portion of the outer edge of the fascia is more conspicuous.

I took one male specimen at Nagahama in July, and there were three females from Gifu in Pryer's collection.

Hab. Japan.

Phibalapteryx punctimarginaria.

Scotosia punctimarginaria, Leech, Entom., Suppl. p. 53 (May 1891).

There were a few specimens from Yesso in Pryer's collection. Mr. Smith captured a female example at Hakone in August; and I have received a female specimen from Chang-yang, taken in July.

Hab. Japan; Yesso; Central China.

Phibalapteryx macularia, sp. n.

Pale brown. Primaries blotched with dark brown on costal area; subbasal line double, enclosing the second costal blotch; beyond the fourth costal blotch there is a double dark brown line, elbowed below costa, waved towards inner margin, and followed by a brown spot between second and third median nervules; submarginal line pale, intersecting the interrupted dark brown border of outer margin; discal spot black. Secondaries have some abbreviated brown lines on basal area; a double central line, followed by a waved line, and an interrupted border on outer margin, the latter intersected by pale submarginal line as on primaries. Fringes pale brown, marked with darker and preceded by a blackish line. Under surface pale brown suffused with fuscous; all the wings have a blackish discal dot and interrupted central line; the outer marginal area of primaries is dusky, and the secondaries have a dusky submarginal band.

Expanse 38 millim.

One female specimen from Omei-shan, July.

Hab. Western China.

Phibalapteryx sparsata.

Geometra sparsata, Hübn. Geom. pl. lxxiv. fig. 308.

Collix (P) *sparsata*, Guen. Phal. ii. p. 358.

Euonymatoxys sparsata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 68.

There was a specimen from Oiwake in Pryer's collection.

Distribution. Europe; Japan.

Phibalapteryx flavovenata, sp. n.

Similar to *P. sparsata*, Hübn., but less irrorated with black; the pale transverse band is not so clearly defined and is broadly bordered inwardly with blackish; there is a black

<-shaped mark just beyond the cell on each wing; fringes darker. Under surface of all the wings whitish; venation broadly ochreous and the fringes black; the discal dot and transverse bands as in *P. sparsata*.

Expanse 25 millim.

One female specimen (minus head) from Ta-chien-lu, taken in May or June.

Hab. Western China.

Genus EUSTROMA.

(Hübner, Verz. Schmett. p. 335; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.)

All the species here included in *Eustroma* have a pencil of hair near inner margin on under surface of primaries; in some of them, however, the areole is simple, and these would perhaps be more correctly placed in *Plemyria*. The species might be arranged in sections as follows:—

1. Areole double.

a. Discocellulars of secondaries oblique; vein 5 from the middle.

fractifasciaria.
chrysoprasis.
propriaria.

reticulata.
melancholica.

b. Discocellulars of secondaries angled; vein 5 from below the middle.

pulchraria.
achatinellaria.
Ledereri.

convergenata.
ludovicaria.
evasecuta.

2. Areole simple.

a. Discocellulars oblique; vein 5 from the middle.

delecta.

Haberhauri.

b. Discocellulars angled; vein 5 from below the middle.

junctilineata.
plurilineata.

miegata.
angularis.

—*Eustroma chrysoprasis*.

Cidaria chrysoprasis, Oberth. Etud. d'Entom. x. p. 34, pl. i. fig. 2 (1884).

Cidaria reticulata, Moore, Proc. Zool. Soc. Lond. 1867, p. 662 (præocc.).

Cidaria flavignis, Butl. Ill. Typ. Lep. Het. vi. p. 87, pl. cxx. fig. 7 (1886); Hampson, Fauna Brit. Ind., Moths, iii. p. 362 (1895).

Four specimens from Pu-tsu-fong, taken in June or July. Oberthür's type was from Ta-tsien-lu.

Distribution. Sikkim (Hampson); Western China.

—*Eustroma fractifasciaria*, sp. n.

Female.—Primaries pale brown, clouded and suffused with

darker, and marked with chocolate-brown as follows:—a small patch at base, four spots on costa and an irregular-shaped patch extending from cell to inner margin, this last is connected with the fourth costal spot by a curved spot, and together with the second and third costal spots appear to be portions of a central fascia; submarginal line whitish, waved; the margin beyond is tinged with fuscous. Secondaries whitely brown tinged with fuscous; central line dusky, edged with the ground-colour; submarginal line of the ground-colour, waved. Under surface pale whitely brown: basal area of primaries suffused with blackish below the cell and irrorated with brownish above, limited by a pale-edged blackish line; submarginal line as above, but not so distinct: secondaries irrorated with brownish, central transverse shade and two waved lines beyond dusky. All the wings have a black discal spot on both surfaces and a dark line.

Expanse, ♂ 38, ♀ 40 millim.

One male specimen from Pu-tsu-fong, and a female from Ta-chien-lu: June.

I have described the female because it is in better condition than the male, but the markings appear to be almost identical in each.

Hab. Western China.

Allied to *E. chrysopraxis*, Oberth.

—*Eustroma propriaria*, sp. n.

Male.—Primaries brown; basal patch darker, limited by a wavy ochreous-brown line; central fascia rather violet-brown, contracted above inner margin, the edges of this fascia are blackish, outlined in pale ochreous brown; submarginal line ochreous brown, indistinct, except towards inner margin, where it is developed into a blotch. Secondaries whitish, darkest on basal half, which is limited by a dusky transverse line; discal spot oblong, reddish brown. Fringes agree in colour with the wings, but are chequered with blackish. Under surface pale brown, darker on apical area of primaries; basal area of all the wings suffused with blackish.

Expanse 38 millim.

One example of each sex from Pu-tsu-fong, and a male specimen from Ta-chien-lu: July.

Hab. Western China.

The male of this species has a patch of rather long black hairs on the middle of the submedian nervure on the under surface of primaries, and also a woolly tuft about the middle of abdominal margin of secondaries.

In the male from Ta-chien-lu and the female from Pu-tsu-fong the central fascia is only slightly angulated and not interrupted below the middle. Possibly these specimens may represent the more usual form of the species. I have, however, described the Pu-tsu-fong male because it is in much better condition than the others.

—*Eustroma reticulata*.

Geometra reticulata, Hübn. Geom. fig. 308.

Eustroma reticulata, Hübn. Verz. Schmett. p. 335; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.

Lygria reticulata, Græser, Berl. ent. Zeit. 1888, p. 406.

Cidaria inextricata, Walk. Cat. Lep. Het. xxxv. p. 1891.

Cidaria arosa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 451; Ill. Typ. Lep. Het. iii. p. 58, pl. lv. fig. 7.

I obtained specimens at Tsuruga and Gensan in July, and my native collector at Hakodate in the same month. There were specimens from Oiwake and Yesso in Pryer's collection, and my collectors met with the species in most of the localities in Western China, and also at Chang-yang.

Distribution. Europe; Ural; E. Siberia; Amur; Corea; Japan; Yesso; Central and Western China; Sikhim.

In China and Japan this species is generally represented by *arosa*, Butl., which is identical with *inextricata*, Walk., but I have typical specimens from Hakodate, Omei-shan, and Chia-kow-ho.

—*Eustroma melancholica*.

Cidaria melancholica, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 450 (1878); Ill. Typ. Lep. Het. iii. p. 58, pl. lv. fig. 6 (1879).

Five female specimens from Yokohama, Oiwake, Gifu, and Yesso in Pryer's collection. I obtained an example of each sex at Hakodate in August.

The variation in marking is very similar to that which obtains in *C. silaceata*.

Only one specimen has been received by me from China. This is a male, taken at Pu-tsu-fong in July; it has the ground-colour suffused with brown and the markings are darker; the pencil of hair on underside is dark brown; measures 50 millim. in expanse, and in form agrees with the *insulata* form of *Cidaria silaceata*.

I propose the name *brunnearia* for this form.

Distribution. Japan; Yesso; Corea; Western China.

—*Eustroma delecta*.

Cidaria delecta, Butl. Ann. & Mag. Nat. Hist. (5) vi. p. 229 (1890); Ill. Typ. Lep. Het. vi. p. 88, pl. cxx. fig. 8 (1896); Hampson, Fauna Brit. Ind., Moths, iii. p. 859 (1895).

One example from each of the following localities :—
Moupin, Omei-shan, and Chia-ting-fu : July.

Distribution. Sikhim ; Khásis (*Hampson*) ; Western China.

—*Eustroma pulchraria*, sp. n.

Closely allied to *E. pyropata*, Hübn., but the ground-colour of primaries is much darker ; the basal area, including chestnut band, is smaller ; the central fascia is wider and all the markings are less angular. The ground-colour of secondaries is whiter and the markings are darker and better defined.

Expanse 40–42 millim.

Six male specimens from Ta-chien-lu, Pu-tsu-fong, Omei-shan, and Che-tou : June and July.

Hab. Western China.

Eustroma achatinellaria.

Cidaria achatinellaria, Oberth. Etud. d'Entom. v. p. 57, pl. iv. fig. 16 (1880).

Lygris achatinellaria, Græser, Berl. ent. Zeit. 1888, p. 406.

I captured a male specimen in Shikotan, one of the Kurile Islands, in August. Oberthür's type was from the Isle of Askold.

Distribution. Amur ; Askold ; Kurile Islands.

Eustroma Ledereri.

Cidaria Ledereri, Brem. Lep. Ost-Sib. p. 88, pl. vii. fig. 17 (1864).

Lygris Ledereri, Græser, Berl. ent. Zeit. 1888, p. 406.

Eustroma Ledereri, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.

Specimens from Yokohama in Pryer's collection. My native collector obtained the species at Hakodate in June or July.

Distribution. East Siberia ; Amur ; Japan ; Yesso.

Eustroma convergenata.

Cidaria convergenata, Brem. Lep. Ost-Sib. p. 88, pl. vii. fig. 18 (1864).

Lygris convergenata, Græser, Berl. ent. Zeit. 1888, p. 406.

Eustroma convergenata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.

A series from Fujisan, Nikko, and Yesso in Pryer's collection.

I obtained the species at Nemoro in Yesso, and in Shikotan, one of the Kurile Islands, in August. My native collector met with it at Hakodate.

Distribution. East Siberia ; Amur ; Japan ; Yesso ; Kurile Islands.

—*Eustroma junctilineata*.

Abraxas junctilineata, Walk. Cat. Lep. Het. xxvi. p. 1123 (1862);
Leech, Trans. Ent. Soc. Lond. 1889, p. 145.

A few specimens from Yokohama in Pryer's collection.

I took the species in Satsuma in May and at Fusan in June; my native collector obtained examples in Kiushiu, and I have received others from Kiukiang, and one example from Ta-chien-lu.

Varies in the width of the black oblique lines on the basal half of the wing, the fourth and fifth of these sometimes coalesce and form a band. On the secondaries the discal spot is often very large and conspicuous, and the central black band broad and well defined.

The specimen from Ta-chien-lu differs from the type in the lesser amount of black marking above the yellow patch on outer margin of secondaries, and in the larger size of the spots in that patch; the discal spot is smaller and there is no basal patch. On the under surface of secondaries the central band is only represented by a patch on costa and a spot towards abdominal margin.

Distribution. Japan; Kiushiu; Corea; Western, Central, and Eastern China.

—*Eustroma ludovicaria*.

Cidaria ludovicaria, Oberth. Etud. d'Entom. v. p. 57, pl. iv. fig. 8 (1880).

Lygris tigrinata, Christ. Bull. Mosc. 1880, p. 64.

Lygris ludovicaria, Græsser, Berl. ent. Zeit. 1888, p. 406.

Eustroma ludovicaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.

I received specimens from Chang-yang, Wa-shan, Chia-kou-ho, Moupin, Omei-shan: June and July.

Oberthür's type was from Askold.

Distribution. Askold; Amur; Central and Western China.

Eustroma plurilineata.

Abraxas plurilineata, Walk. Cat. Lep. Het. xxiv. p. 1123 (1862).

Four specimens taken by a native collector at Ningpo in June.

Hab. North-eastern China.

Eustroma exsecuta.

Baptia exsecuta, Feld. Reis. Nov. v. pl. cxxxiii. fig. 15 (1875).

There were specimens of the type form from Oiwake in Pryer's collection. I obtained typical examples at Gensan in July, and Mr. Smith took some at Hakone in August.

Var. *latifasciaria*, nov.

Smaller than the type.

All the wings have a broad white fascia; that on secondaries with an angular projection towards outer margin.

I took examples of this form at Hakodate in August, and there was a specimen from Yesso in Pryer's collection.

Distribution. Japan; Yesso; Corea.

E. exsecuta can always be easily distinguished from *Plemyria tibiale*, Esp., which it greatly resembles, by the fringes of the secondaries. These, in the former species, are black, patched with white at outer angle and before anal angle; but in the latter they are entirely black.

—*Eustroma Habershaueri*.

Baptria Habershaueri, Led. Wien. ent. Mon. 1804, p. 170, pl. iii. figs. 9, 10 (May).

Plemyria Habershaueri, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.

Odesia Kindermannii, Brem. Lep. Ost-Sib. p. 89, pl. vii. fig. 19 (1864).

Polythrena Kindermannii, Græser, Berl. ent. Zeit. 1888, p. 404.

A long series in Pryer's collection, many of the specimens labelled Oiwake; my collector obtained the species at Hakodate in July, and I have received specimens from Ta-chien-lu and Chow-pin-sa, taken in June and July.

Distribution. Armenia; Amur; Japan; Yesso; Western China.

The Japanese specimens are all of the *Kindermannii* form, but they exhibit a good deal of variation in the white marking, especially on the secondaries; one specimen is without a trace of the fascia on these wings. The specimens from Western China are of the typical form, but there is less black on basal third of the secondaries, and the white marking on primaries is broader. In the specimen from Yesso all the white markings are very broad.

This species can be at once separated from *E. exsecuta* by the chequered fringe.

—*Eustroma miegata*.

Polythrena miegata, Pouj. Ann. Soc. Ent. Fr. 1895, p. 314, pl. vii. fig. 20, ♂ (non 20 a, ♀).

Female.—Rather paler than the male, and the abbreviated fascia is broader.

Poujade only refers to the male of this species. The insect he considered to be the female is a distinct species.

I received several male specimens from Pa-tsu-fong, and one female from Chia-ting-fu: all taken in June and July. Poujade's type was from Moupin.

Hab. Western China.

—*Eustroma angularia*, sp. n.

Polythrena nigata, Pouj. Ann. Soc. Ent. Fr. 1895, p. 314, pl. vii. fig. 20 a, ♀.

Male.—Bright yellow, marked with black. Primaries have a basal patch finely marked with yellow; an angulated fascia separated from basal patch by a thin angulated yellow line; central fascia indicated by an elongated patch on costa and roundish patch on inner margin; outer marginal border deeply indented about the middle. Secondaries have a triangular patch on abdominal margin, streaked with yellow and spotted with the same colour on its upper edge; there is a large spot at anal angle, and the outer margin is bordered from middle to apex. Fringes black, marked with yellow below apex and from middle to inner angle of primaries; on the secondaries they are yellow marked with black from middle to anal angle. Under surface similar to above, but the black triangular patch on secondaries is only indicated by some disconnected spots.

Female.—Rather larger, but colour and markings as in the male.

Expanse, ♂ 30, ♀ 33 millim.

Several specimens of each sex from Omei-shan, Pu-tsu-fong, Ni-tou, Moupin, Chia-ting-fu, Ta-chien-lu.

Hab. Western China.

Genus PLEMYRIA.

(Hübner; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.)

Plemyria tibiale.

Noctua tibiale, Esp. Noct. pl. clxiv. fig. 2 (1790).

Minos Eversmannaria, Herr.-Sch. Suppl. fig. 443.

Eustroma tibialis, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.

Odezia tibiale, Gräser, Berl. ent. Zeit. 1888, p. 404.

There were eight specimens in Pryer's collection; two of these were labelled Yesso and one Oiwake. My native collector took one example at Hakodate in June, and I obtained the species at Gensan in July.

Gräser records it from Amurland.

Distribution. Europe; Amur; Corea; Japan; Yesso.

In some specimens the white bands are very broad on all the wings. This species is without the pencil of hair on under surface of primaries, and cannot therefore be referred to *Eustroma*.

Plemyria hecate.

Melanippe hecate, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 448 (1878);

Ill. Typ. Lep. Het. iii. p. 55, pl. liv. fig. 12 (1879).

There was an extensive series from Oiwake in Pryer's Ann. & Mag. N. Hist. Ser. 6. Vol. xix.

collection. My native collector obtained two specimens at Hakodate in June; these are smaller than any in Pryer's series, and the central white band on secondaries and towards costa of primaries is wider.

Hab. Japan and Yesso.

—*Plemyria hastata*, Linn., *chinensis*, nov.

Basal half of all the wings black, traversed by three or four more or less interrupted wavy lines; outer margin broadly bordered with black, intersected by a wavy interrupted white line; intervening space white, intersected by a transverse series of black dots.

Sometimes the secondaries are free from white markings on the black portions of the wing, and there are very few of such markings on the primaries.

Expanse 36–38 millim.

A nice series from Pu-tsu-fong, Ta-chien-lu, Omei-shan: May and June.

Hab. Western China.

Specimens of *P. hastata* from Amurland, in my collection, agree well with European examples.

—*Plemyria lugens*.

Melanippe lugens, Oberth. Etud. d'Entom. xi. p. 34, pl. ii. fig. 4 (1886), xviii. p. 38, pl. iii. fig. 38 (1893).

Cidaria lugens, Alph. Rom. sur Léop. vi. p. 79 (1892).

My collectors in Western China obtained this species during June and July in most of the localities that they visited.

Alphéraky records a female specimen from the province of Gan-Sou, taken in July.

Hab. Western China.

Plemyria rivata.

Geometra rivata, Hübn. Geom. fig. 409.

Plemyria rivata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.

Melanippe supergressa, Butl. Ill. Typ. Lep. Het. iii. p. 55, pl. liv. fig. 11 (1879).

Several specimens from Yokohama and Oiwake in Pryer's collection. I obtained the species at Nagasaki in May, at Gensan in June, and at Tsuruga, Hakodate, and Shikotan in August. My native collector took examples at Gensan in July. All are identical with European specimens.

Distribution. Europe; Amur; Japan; Yesso; Corea.

—Plemyria parvularia.

Primaries white; basal two thirds dark grey, outer marginal border grey, traversed by a rather wavy white line; there is a black cuneiform mark above the middle of outer margin and a whitish ring just below it; the outer edge of the basal two thirds is obtusely angled above the middle. Secondaries fuscous grey, darker on basal half, and with a pale central band; submarginal line indistinct. Fringes grey. Under surface ochreous brown; basal area of primaries fuscous, and the outer marginal area is suffused with the same colour; the secondaries have some fuscous lines and a central band.

Expanse 25 millim.

One male specimen from Pu-tsu-fong, June.

Hab. Western China.

Allied to *P. galiata*, Hübn.

Plemyria fatuaria, sp. n.

Primaries white with brownish markings; basal patch with the outer edge almost straight; central fascia with the inner edge ill-defined and the outer indented; the outer marginal area has a cloud at apex, one just above the middle, and a smaller one at angle, each is intersected by the white wavy submarginal line, which is edged with brownish between the clouds; the space of ground-colour beyond central fascia is traversed by an interrupted dusky line; discal spot black, placed on inner edge of central fascia; fringes white, chequered with brownish. Secondaries fuscous grey, with indications of a paler band beyond the middle; submarginal line wavy, whitish; fringes white, marked with fuscous grey. Under surface fuscous grey, with an obscure darker angulated line beyond the middle, followed by a faintly paler band: secondaries whitish, irrorated with fuscous; two fuscous bands on central area, the outermost with an angular expansion below the middle enclosing a patch of the ground-colour; submarginal band fuscous.

Expanse 20 millim.

Four specimens from Chang-yang, July.

Hab. Central China.

Plemyria bicolorata.

Phalena bicolorata, Hufn. Berl. Mag. iv. 608 (1768).

Geometra rubiginata, Hübn. Geom. fig. 260.

Plemyria bicolorata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.

There were a few specimens from Yesso in Pryer's collection, and I took two or three at Nemoro and Hakodate in August.

Japanese examples are larger but do not otherwise differ from European specimens.

Distribution. Europe; E. Siberia; Amur; Japan; Yesso.

—*Plemyria castaria*, sp. n.

Primaries creamy white; basal half traversed by three black wavy lines commencing as spots on the costa; outer margin bordered with black, but before this there is a black dash on costa from which a double black sinuous line proceeds to inner margin, a black cloud about the middle of this line unites it with the border; discal spot black. Secondaries white, a narrow black band on outer margin shaded inwardly with grey. Fringes: of primaries black with some pale dots at their base; of secondaries dark grey, becoming white towards outer angle and on outer margin, spotted as on primaries. Under surface very similar to above, but the secondaries have a black discal spot and indications of a central band; the submarginal band is clearer and there is no cloud connecting it with the marginal border. Antennæ serrated in the male.

Expanse 28 millim.

Six male specimens from Moupin, Ni-tou, Pu-tsu-fong: July.

Hab. Western China.

—*Plemyria kezonmetaria*.

Melanippe kezonmetaria, Oberth. Etud. d'Entom. xviii. p. 88, pl. iv. fig. 48 (1893).

I received a nice series from Ta-chien-lu and one male specimen from Wa-ssu-kow, taken by my native collectors in May and June.

Hab. Western China.

The antennæ of the male are shortly bipectinate; apex simple. Perhaps this species would be more properly placed in *Asaphodes*, Meyr.

—*Plemyria ouanguemetaria*.

Melanippe ouanguemetaria, Oberth. Etud. d'Entom. xviii. p. 88, pl. iv. fig. 62 (1893).

My collectors met with this species at Ta-chien-lu and Wa-ssu-kow, and at How-kow: June and July.

Hab. Western China and Thibet.

Antennæ in the male bipectinated; apex simple.

—*Plemysia bellaria*, sp. n.

White, with black markings. Primaries have bands on basal area, broadest on costa; central band indicated by a hook-shaped mark on the costa and some dots on inner margin; a broad border on outer marginal area, tapering towards inner margin, enclosing three white spots, one on costa, one about the middle, and one towards inner margin. Secondaries have a slender central band from abdominal margin to middle of the wing, and a border on outer margin; the latter encloses two white spots, one in the middle, and one at anal angle, and a minute dot above the middle spot. Fringes black and white. Under surface as above. Antennæ bipectinated, the shaft black ringed with white, and the pectinations rather widely apart.

Expanse 25 millim.

Four male specimens: Ichang, April; Ta-chien-lu, Ni-tou, May and July.

Hab. Central and Western China.

[To be continued.]

LVI.—*The Ochre-footed Scrub-Squirrels of East Africa.*

By W. E. DE WINTON.

THERE appears to be great confusion among naturalists as to the specific determination of the most common small squirrels of East Africa. Dr. F. A. Jentink, when looking over the specimens in the British Museum previous to writing his most excellent "Monograph of the African Squirrels," published in 'Notes from the Leyden Museum,' vol. iv. p. 1 (1882), noticed that the specimens from East Africa were distinct from the South-African species, *Sciurus Cepapi*, A. Sm.; unfortunately he never described the forms, but includes under *S. Cepapi* (t. c. p. 26) all the small unstriped squirrels from South and East Africa.

Naturalists have continued to record specimens from East Africa under the latter name, although Dr. Huet (Nouv. Arch. Mus. iii. ser. 2, p. 154, pl. vii. fig. 2, 1880) described the form from Bagomoyo as a distinct species, giving it the name of *S. ochraceus*. Dr. Pagenstecher (Bericht Naturh. Mus. Hamburg, 1885, p. 42) described a form from the Pangani River and Mount Meru under the name of *S. Cepapi aruensis*, at the same time stating that its affinities lie with *S. Cepapi*, *S. multicolor*, and *S. Aubryi* = *S. rufobrachiatus*; such a generalized form should surely be worthy of more than

subspecific rank, as the three species named are such very widely separated forms *inter se*. Dr. Matschie (SB. Ges. nat. Freund. 1894, p. 256) disregards these two species entirely, giving the former name as a synonym of *S. Cepapi*, and describes a specimen as *S. Pauli* from a living animal sent home from Tanga and the skin of a very young individual from the same neighbourhood.

S. Cepapi, a larger and stronger animal, only occurs south of the Zambesi River; northward in Mozambique the bright-coloured striped squirrel *S. flavivittis* is found; north of the Rufigi River the faintly striped *S. ochraceus* occurs at Dar-es-Salaam, Bagomoyo, and in Usagara. The side stripes of this latter species, which at all times is very faint, varies much in distinctness, as is well shown in the series in our Museum; in some specimens it is scarcely perceptible and would, in all probability, be overlooked unless expected. The forms from Pangani and Tanga, agreeing with the last-named in having a dull greenish-white belly, have been described as stated above, and if, as I suppose, *S. aruscensis* belongs to this group, it is difficult to see how *S. Pauli* can be made out distinct, if, indeed, either are separable from *S. ochraceus*.

About Mombasa and inland as far as 6000 feet on Kilimanjaro, and northward in the coast region, we find the orange-bellied form which has lately been described by Mr. S. Rhoads (Proc. Ac. Philad. 1896, p. 522) as *S. ganana*. In the highlands of Kikuyu we find yet another form, very dark in colouring and rather larger than its allies; this species I have pleasure in naming *S. Jacksoni*, after the distinguished explorer, Mr. F. J. Jackson, who presented the specimens to the Museum and has done so much in adding to our knowledge of the fauna of East Africa in several branches of zoology. I think there can be little doubt that the squirrel mentioned by Mr. Rhoads (*l. c.* p. 521) from Marsabit, an eastern offshoot of Mount Kenia, is of this species.

Sciurus Jacksoni, sp. n.

General colour dark olive-green, slightly washed with brown; the face, rump, upper arms, and legs with a rather stronger brown tint; the feet and hands more or less grizzled rufous orange or rust-coloured; a broad buff stripe above and below the eyes; cheeks and ears grizzled of the general body-colouring; on the sides the dark colouring of the upper parts gradually passes into that of the paler underparts, the centre line of the chin, throat, and belly and the inner sides of

the legs only being greenish orange-buff, the bases of all the hairs slate-coloured. The distichous tail is coloured much like the body, but, owing to the broader annulations of the hairs, the brighter colour is more conspicuous, especially beneath, as is usual in members of this group.

The colour of the upper parts of this squirrel is absolutely identical with some specimens of the West-African *S. posnisi*, but the annulations on the fur are rather broader and the tail shows brighter colouring; the pale eye-stripes and more rufous feet at once distinguish it; beneath, the paler colour of the belly and inner sides of the limbs make the likeness less obvious. Colour, however, is the only form of resemblance, for the size of the ears and feet and the different shape of the tail widely separate the two species.

Mammæ: 1—1—1=6.

Type, ♀, 98. 2. 3. 24 Brit. Mus. Killed in August.

Loc. Kikuyu.

Collected and presented by F. J. Jackson, Esq.

Measurements, taken from dried skin:—Head and body 180 millim.; tail 155; hind foot 41; ear 13.5 (c.).

Skull: greatest length between uprights 42.5, greatest breadth 25.5; nasals 11.5 × 6; constr. int. orb. 11.6, behind p.o.ps. 12.7; brain-case 19, height 18, basal length 35.5 (c.); henselion to back of palate 17.6; incisive foramina 3.3 × 2.1; molar series 7.1; breadth outside ^{ma. 1} 10.3; diastema 10; mandible, greatest length (bone only) 24.5, height 15.9.

Larger skull than *S. ochraceus*, and the profile more arched.

Nasals almost square posteriorly, not reaching so far back as the posterior portion of the maxillæ. P.o.ps. well developed, running to sharp points. Zygomata broad in squamosal portion.

The type is a rather old female; the skulls of two younger specimens are somewhat smaller.

LVII.—Coleoptera collected in the Transvaal.

By W. L. DISTANT.

Fam. Cetoniidæ.

I was somewhat successful in obtaining a number of species belonging to this family in the Transvaal, and I think the following list is a fairly representative one for that region. Their habits are very varied. Of course the larger number are found on bloom; but *Goliathus albosignatus* flies among its

favourite trees, a species of *Zizyphus*; *Cheiolasia Burkei* and *Dicranorrhina Derbyana* are usually met with on the twigs or silky leaves of a species of *Combretum*; *Oplostomus fuliginosus* I have found in the dry dung of oxen; *Trogodes rotundicollis* under stones with ants; *Pachnoda flaviventris* and *Plesiorrhina plana* are sometimes apple-destroyers, as I have seen in Natal; *Diplognatha silicea* and *Heteroclitia Jansoni* I have never captured but on the wing, and they are both very swift fliers.

I have to acknowledge the great assistance freely given me by my friend Mr. Oliver Janson in the identification of some of the obscure species and in advice generally.

The species were all captured by myself except where other names are given of those from whom I received the specimens.

Species obtained in the Transvaal.

- Goliathus albosignatus*, Bohem. Rustenburg (W. Ayres and W. L. D.).
Hypelogenia concava, G. & P. Pretoria.
Dicranorrhina Derbyana, Westw. Rustenburg (W. Ayres and W. L. D.), Pretoria.
Cheiolasia Burkei, Westw. Rustenburg (W. Ayres, P. Kranz, and W. L. D.).
Dyspilophora trivittata, Schaum. Barberton (Dr. Percy Rendall), Pretoria.
Plesiorrhina plana, Wied. Barberton (Dr. Percy Rendall), Rustenburg (W. Ayres), Pretoria.
Genyodonta flavomaculata, Fabr. Barberton (Dr. Percy Rendall).
 Var. *egregia*, Bohem. Rustenburg (W. Ayres), Pretoria.
Melinesthes algoensis, Westw. Rustenburg (W. Ayres), Pretoria.
 Var. *flavipennis*, Westw. Barberton (Dr. P. Rendall), Pretoria.
 — *umbonata*, G. & P. Pretoria.
Ischnostoma nasuta, Schaum. Pretoria.
Pseudoclimberia permutans, Burm. Pienaars River (Thomson), Pretoria, Warm Baths, Waterberg, Rustenburg.
Heteroclitia Jansoni, sp. n. Pretoria.
Phaenocarpa umbrosa, G. & P. Rustenburg (W. Ayres), Pretoria.
Anathocera hirta, Burm. Zoutpansberg (Kassner).
Elaphinia nigropunctata, Pering. Barberton (Dr. P. Rendall).
 — *tigrina*, Oliv. Barberton (Dr. P. Rendall), Zoutpansberg (Kassner), Rustenburg.
 — *luteostata*, Bohem. Pretoria.
Psacodoptera velutina, Pering. Pretoria.
Gametis balteata, De Geer. Pretoria.
Anoplochilus figuratus, Bohem. Pretoria.
 — *tomentosus*, G. & P. Zoutpansberg (Kassner), Pretoria.
Leucocelis marginalis, Swartz. Zoutpansberg (Kassner), Pretoria.
 — *testaceoguttata*, Bl. Zoutpansberg (Kassner), Barberton (Dr. P. Rendall), Pretoria.
 — *amabilis*, Schaum. Pretoria, Warm Baths, Waterberg.
 — *Perroudi*, Schaum. Pretoria.
 — *cinctella*, Schaum. Zoutpansberg (Kassner), Barberton (Dr. P. Rendall), Pretoria.

- Leucocelis rubra*, G. & P. Pretoria.
 — *hæmorrhoidalis*, Fabr. Pretoria.
 — *ænicollis*, Schaum. Pretoria.
Trichostetha capensis, Linn. Middelburg (*Kaasner*).
 — *prunipennis*, Burm. Barberton (*Dr. P. Rendall*), Pretoria.
Tephraea dichroa, Schaum. Barberton (*Dr. P. Rendall*), Waterberg (*Wilde*), Pretoria.
 — *morosa*, Schaum. Pretoria, Pienaars River.
Pachnoda cincta, De Geer. Pretoria, Pienaars River.
 — *flaviventris*, G. & P. Barberton (*Dr. P. Rendall*), Pretoria.
 — *leucomelana*, G. & P. Pretoria, Pienaars River.
Pseudoprotatia amakosa, Bohem. Barberton (*Dr. P. Rendall*), Pretoria.
Niphetophora carnea, Burm. Pretoria.
Rhabdotis aulica, Oliv. Rustenburg (*W. Ayres*), Pienaars River (*Thomson*), Barberton (*Dr. P. Rendall*), Pretoria.
 — *sobrina*, G. & P. Pretoria.
 — *semipunctata*, Fabr. Pretoria.
Diplognatha silicea, McL. Barberton (*Dr. P. Rendall*), Pretoria, Pienaars River.
 — *carnifex*, Fabr. Lydenburg District (*Zutrzenka*).
 — *hebræa*, Oliv. Rustenburg (*W. Ayres*), Pretoria.
Ptychophorus undatus, Kirby. Barberton (*Dr. P. Rendall*).
 — *leucostictus*, Schaum. Pretoria.
Spilophorus plagiatus, Bohem. Pretoria, Pienaars River.
Oplotomus platycephalus, Bohem. Barberton (*Dr. P. Rendall*).
 — *fuliginus*, Oliv. Pretoria, Warm Baths, Waterberg.
Pilinurgus subundatus, Westw. Pretoria, Warm Baths, Waterberg.
Ctenochilus turbatus, Westw. Barberton (*Dr. P. Rendall*), Pretoria.
 — *appendiculatus*, Gerst. Lydenburg District (*Zutrzenka*).
Genuchus dealbatus, sp. n. Lydenburg District (*Zutrzenka*).
Trogodes rotundicollis, Bohem. Pretoria, Rustenburg.

Other Species obtained in Natal.

- Eudicella Smithi*, McLeay. Durban.
Amaurodes Passerinii, Westw. Durban.
Elaphinis irrorata, Fabr. Durban.
Trichostetha placida, Bohem. Durban.
Macroma cognata, Schaum. Durban.
Scythropesthes bicolor, Burm. Durban.

Heteroclitia? Jansoni, sp. n.

Head above, thorax, and scutellum dark olivaceous green; elytra dark indigo-blue, sometimes with a purplish tint. Body beneath and legs piceous.

Head coarsely punctate, more sparingly so near basal margin, where it is somewhat levigate; the antennæ dark castaneous. Thorax thickly and coarsely punctate, with a more or less continuous central longitudinal levigate impression; the basal margin also levigate, especially in front of scutellum. Scutellum more or less tessellate, the lateral margins and a central impression levigate. Elytra coarsely punctate and tessellate, their inner margins broadly costate

to about one fourth before apex; two discal costate lines on each elytron which are somewhat contiguous at base and convexly united at about one fourth from apex, close to which are two submarginal similarly united costate lines, which are very strongly raised and prominent at basal angle; outer marginal ridge levigate. Head and thorax beneath and legs pilose, particularly at base of head, where there is a thick tuft of ochraceous hairs. Body beneath and legs coarsely punctate, less coarsely and prominently punctate on the abdomen.

Long. 12 millim.

Hab. Transvaal, Pretoria (*Distant*).

Var.—Elytra testaceous.

I captured five specimens with the blue elytra and four with the same testaceous in hue, all males. Its habits are peculiar, not frequenting bloom, but flying swiftly along banks or paths amid bush, when it may easily be mistaken for a large blow-fly. I found it a very local and scarce beetle.

Mr. O. Janson, to whom I submitted specimens, writes:—"I should refer this species to *Heteroclita* rather than create a fresh genus (as genera in this group are, perhaps, already too numerous), especially as the male is the only sex known at present. It differs, however, in several characters, such as the untoothed anterior tibiae and small linear mesosternal process. In some respects it more nearly agrees with *Heterophana*, and also, if these recently erected genera are really distinct from *Heteroclita*, with *Mazoe* (Peringuey) and *Diploa* (Kolbe).

"It would appear to be most nearly allied to *H. Rasuperi*, Schaum."

Genuchus dealbatus, sp. n.

Bright, shining, black; thorax with the basal angles broadly sanguineous; elytra with a broad submarginal whitish fascia, broadening towards apex, where it is recurved and convexly terminates. Head thickly and coarsely punctate. Thorax coarsely punctate, most thickly so on anterior and lateral areas, slightly foveate on each side of disk. Elytra coarsely punctate and tessellate, their inner margins moderately costate; two strongly costate longitudinal lines on disk, commencing near base and terminating at about one third before apex; humeral angles prominent and impunctate. Thorax beneath and femora moderately pilose.

Long. 14 millim.

Hab. Transvaal, Lydenburg District (*Zutrzenka*).

This species is allied to *G. elongatulus*, G. & P., from which it differs by the white fascia around the elytra, the much more strongly punctured elytra, and by scarcely a trace of the central furrow to the thorax.

Cænochilus appendiculatus, Gerst.

Cænochilus appendiculatus, Gerst. Arch. Naturg. xxxiii. 1, p. 39. n. 68 (1866); v. d. Decken's Reise, ii. (2) p. 104, t. vi. fig. 6 (1873); Westw. Thes. Ent. Oxon. p. 38, t. xiii. fig. 2 (1874).

I refer one specimen received from the Lydenburg district of the Transvaal to this species. Its principal divergence is in size. The type was described as 19½ millim. in length; my specimen measures 25 millim.

LVIII.—On a Collection of Heterocera made in the Transvaal.
By W. L. DISTANT.

Fam. Sphingidæ.

Of the twenty-two species of this family which I obtained in the Transvaal and are here enumerated no fewer than five (*T. celerio*, *D. livornica*, *D. nerii*, *P. convolvuli*, and *M. atropos*) also occur or have been taken in Britain.

For some kind of uniformity I have followed Mr. Kirby's 'Catalogue' in the generic division and arrangement, save in the case of the genus *Ambulyx*.

Species obtained in the Transvaal.

- Cephonodes hylas*, Linn. Pretoria and Zoutpansberg.
- Macroglossa trochilus*, Hübn. Barberton (*J. R. Harrison*), Pretoria.
- Lophuron pylas*, Cram. Zoutpansberg (*Kæssner*), Pretoria.
- *pusillum*, Feld. Barberton (*Dr. P. Rendall and J. R. Harrison*).
- *minutum*, sp. n. Pretoria.
- Diodosida murina*, Walk. Barberton (*Dr. P. Rendall*).
- Basiothia medea*, Fabr. Barberton (*Dr. P. Rendall*), Pretoria.
- Theretra capensis*, Linn. Pretoria.
- *eson*, Cram. Barberton (*Dr. P. Rendall*).
- *Schenckii*, Müschl. Barberton (*Dr. P. Rendall*), Pretoria.
- *celerio*, Linn. Barberton (*Dr. P. Rendall*), Pretoria.
- Deilephila livornica*, Esp. Pretoria.
- *ophites*, Cram. Lydenburg District (*Zutrzenka*).
- Daphnis nerii*, Linn. Pretoria.
- Ambulyx postica*, Walk. Pretoria.
- *piabilis*, sp. n. Pretoria.
- Nephela vau*, Walk. Zoutpansberg (*Kæssner*).
- Phlegothonitius Mauriti*, Butl. Lydenburg District (*Zutrzenka*).
- *convolvuli*, Linn. Barberton (*Dr. P. Rendall*), Pretoria.
- Manduca atropos*, Linn. Barberton (*Dr. P. Rendall*), Pretoria.
- Lophontethus Dumolinsii*, Latr. Pretoria.
- Polyptychus Grayii*, Walk. Lydenburg District (*Zutrzenka*).

Where not otherwise specified, the captures were my own.

Lophuron minutum, sp. n.

Body above greyish brown; head and thorax very strongly pilose; thorax on each side with a slightly oblique fascia, whitish internally and castaneous outwardly. Abdomen above with four longitudinal castaneous fasciæ, the outermost of which on each side contains three prominent white hairy spots.

Anterior wings above greyish brown, with the following dull castaneous markings:—a short narrow oblique stripe near base, a large subquadrate spot at middle of inner margin, and a larger one beyond it at costal margin (both extending about halfway across the wing), and a broad irregular outer marginal fascia.

Posterior wings golden yellow, outer margin dull castaneous, the fringe greyish brown; a faint basal streak and subcostal spot both castaneous.

Wings beneath much paler and more obscure than above, the posterior wings without the golden-yellow ground-colour.

Exp. 26 millim.

Hab. Transvaal, Pretoria (*Distant*: April).

Apparently a late species, appearing at the end of the Transvaal summer.

Ambulyx piabilis, sp. n.

Anterior wings pale ochraceous, somewhat darker on apical areas, with five brownish elongate costal spots, basal two of which enter cell, third situate a little beyond cell, and fourth and fifth near apex.

Posterior wings bright golden yellow, minutely spotted with sanguineous, excepting abdominal area, which is pale ochraceous and unspotted, and with a large basal blackish spot with a bluish centre.

Wings beneath pale ochraceous; anterior wings with about basal half golden yellow, in which area the two basal brownish costal spots above are castaneous beneath; posterior wings very minutely and obscurely speckled with brownish, the basal spot above indicated by a castaneous spot beneath.

Body above pale ochraceous; head and thorax with a central brown longitudinal fascia.

Exp. 97 millim.

Hab. Transvaal, Pretoria (*Distant*).

A. piabilis is allied to *A. conspersa*, Dewitz, and holds an intermediate position between that species and *A. postica*, Walk.

I have followed Hampson in placing these species in the genus *Ambulyx*. They are located by Kirby in *Basiana* and by Rothschild in a proposed new genus—*Pseudoclanis*.

LIX.—*Descriptions of some new Species of Acræidæ collected by Mr. F. J. Jackson at Ntebi, Uganda.* By EMILY MARY SHARPE.

Family *Acræidæ*.

Acræa pervia, sp. n.

Resembles the Asiatic group containing *A. moluccana*, Feld., *A. Dohertyi*, Holland, and *A. parce*, Stgr.

Upperside. Entirely transparent, the costa and hind margin narrowly bordered with black, becoming much broader at the apex; the base black, extending along the inner margin to about the middle of the wing.

Hind wing. Basal area brownish black, with black spots, almost invisible on the upperside; the discal portion transparent from the costa to the first median nervule, the narrow brownish-black border becoming much broader towards the anal angle; this black border extending along the first median nervule and uniting with the dark basal area, thereby dividing a yellow patch on the inner margin, which, however, does not extend right up to the base; a yellow spot also plainly marked between the sub-costal nervule and the first median nervule.

Underside. Fore wing entirely transparent; the costa yellow, like the apex and hind margin, the latter having yellow spots; the apex distinctly yellow and streaked with black lines; the hind margin with a black spot between the yellow ones at the end of the black nervules, from the fifth sub-costal nervule to the first median nervule.

Hind wing. The whole of the basal area yellow, sprinkled heavily with black spots, this yellow also extending along the hind margin, and becoming much narrower towards the costa. This yellow border is divided by the black nervules and again divided into twin spots by smaller median black streaks between the nervules. On the underside this species somewhat resembles that of *A. lycoides*, Boisd., and *A. dejana*, Godm. & Salv.

Expanse ♂ 2·3 inches.

The female is similar to the male; the black markings are browner in colour, the yellow patch on the hind wing much paler, and is not broken by any black markings as in the male. The underside is exactly like that of the male, the yellow being paler.

Expanse 2·5 inches.

Hab. Ntebi, Uganda: March to May 1895.

Acræa ntebiæ, sp. n.

Allied to *A. lycoides*, Boisd.

The fore wing is not so transparent, being entirely brownish

black, with a transparent space consisting of three ovate spots, only divided by the black nervules near the apical portion of the wing, and followed beneath by a second irregular row of three whitish spots. The first of these is in the discoidal cell; the second, and largest, of the three lies between the first and second median nervules, and the third one, which is somewhat spear-shaped, between the sub-median nervure and the first median nervule.

Hind wing. Brownish black at the base, extending more narrowly along the costa and forming a fairly broad border along the hind margin, which is much darker brown than the basal area, where there are some indistinct black spots. The discal portion of the wing has a yellow transverse band, narrower than in *A. lycoides*, commencing a little below the costal nervure, covering about half of the cell and extending to the middle of the inner margin. In the discoidal cell, close to the discocellular nervule, is a small black spot, belonging to the indistinct basal series.

Underside. Brownish black; costa, apex, and hind margin sulphur-yellow as far as the first median nervule; this yellow portion crossed by black nervules and divided into twin spots by a median line of black. The whitish transparent markings of the upperside very distinctly indicated.

Hind wing. Entirely sulphur-yellow, the basal area profusely dotted with black spots; discal portion uniform yellow, followed by the border, which is plainly divided up into twin streaks by the black nervules and black median lines, which are more pronounced than in either *A. lycoides* or *A. dejana*, Godm. & Salv.

Expanse 2 inches.

Hab. Ntebi, Uganda: November to December 1895.

Acræa humilis, sp. n.

Nearest to *A. quirina* in size, but differs in both wings being entirely transparent and brownish in colour, where the markings occur, without a single spot visible.

Fore wing. Quite transparent; the costa, hind margin, inner margin, nervules, and base of wing dusky brown.

Hind wing. Exactly like the fore wing.

Underside. Very similar to the upperside, the dusky shading being rather of a warmer brown. At the base of the hind wing this warm brown colour is more pronounced, and there is one black spot between the sub-median nervure and the first median nervules; another minute black spot close to the base.

Expanse 1.5 inch.

Hab. Ntebi, Uganda: November to December 1895.

MISCELLANEOUS.

On the Organization and Affinities of Pleurotomaria.

By MM. E.-L. BOUVIER and H. FISCHER.

THE *Pleurotomariæ* are the first mollusks (one might almost say the first animals) of which remains are found in the fossil state. As old as the oldest Trilobites, but curiously more tenacious of existence, they were not extinguished like the Trilobites during the Carboniferous epoch. They have left a great variety of forms in the Jurassic deposits, they were perpetuated, though somewhat feebly, through the Tertiary period, and are still represented in our day by certain species, for the most part of extreme rarity. Of these last absolutely nothing was known but the shell until the 'Blake,' under the direction of Alexander Agassiz, captured four living *Pleurotomariæ* off the Antilles in 1879. From these specimens M. Dall was able to determine that the anus is still situate on the median dorsal line in the animals we are considering, that they have two branchiæ symmetrically situated, two urinary orifices also symmetrical, and that thus they present, as one might expect, by far the most primitive characters of all Gasteropods. Since that time the Japanese have found another living *Pleurotomaria*; but it was not made the subject of any research, so that the internal organization of these creatures might have remained for a long time unknown had not M. Agassiz, thanks to the courteous intervention of M. Milne-Edwards, handed over to us one of the specimens of *Pleurotomaria Quoyana* collected by the 'Blake.' We cannot sufficiently express our gratitude to the distinguished American zoologist for his liberality.

From its general organization *P. Quoyana* approaches most nearly to the Diotocardia of the most normal type (Haliotidæ, Trochidæ). Its sense-organs occupy the same position; its buccal mass appears to be built on the same type; it has the same myology, the same cerebroid and buccal ganglia, the same labial commissure, the same crossed (*croisée*) visceral commissure.

The characters which distinguish it from the other Diotocardia are:—(1) the feeble development of the epipodium; (2) the altogether peculiar origin of the branches of the visceral commissure; (3) the structure of the scalariform nervous cords which traverse the foot.

Of the "epipodial collarette" we will say nothing except that, greatly reduced as it is in general in *Pleurotomaria*, it is imperceptible in our specimen, and there is every reason for believing that in the genus under consideration we see it at the very beginning of its development.

As for the "branches of the visceral commissure," they are not in any wise detached, as in the other Diotocardia, from the most anterior portion of the nerve-cords situate in the foot; they arise from cerebro-pallial links towards the middle of their length, and

appear to be nothing more than a strong branch from them. This is, with but slight difference, the arrangement observable in the Placophores, in which the cerebro-pedal link is quite separated from the pedio-pallial (*Acanthopleura salamander*, according to Herr von Jhering, *A. Savatieri*), and where the visceral commissure is formed, following the hypothesis of Herr Bütschli, by the median and ventral fusion of the two symmetrically situated stomachal nerves (*Chiton fusciculatus* and *Ch. magnificus*, according to M. Haller; *C. cinereus*, according to Herr von Jhering).

The "scalariform nervous cords" are remarkable for the ganglionic projection, in the form of a very elongated horn, which both exhibit in front of their most anterior commissure. This horn presents along its whole length, notably on its outer side, a broad and deep furrow, which is continued upon the cords and which divides each of them into an upper pallial portion and a lower pedal; the cerebro-pallial link arises at the end of the pedal portion.

The pedal portion, behind the great anterior commissure, presents the usual accessory commissures and gives origin to numerous nerves to the lower surface of the foot; the pallial portion has no commissures, it supplies the mantle, the columellar muscle, the muscles of the upper surface of the foot, and probably also the epipodium. The pallial portion, in other words, behaves exactly like the pallial cords of the Placophores, the pedal portion like the pedal cords of these latter—so much so that the pallio-pedal cords of *Pleurotomaria* ought to be considered as the result of concrescence* of the pedal cords and the ganglionic portion of the pallial cords† which one observes on each side in the Placophores.

To summarize: *Pleurotomaria* presents the first stage of a ganglionic concentration, which is more and more accentuated as one rises in the scale of mollusks. In *Haliotis* and *Trochus* the cords of the foot are composed, as has been very justly maintained by M. de Lacaze-Duthiers and by M. Boutan, of a superior pallial and an inferior pedal portion; but the pallial portion tends to isolate itself under the form of a ganglionic swelling situate in front at the origins of the visceral commissure. In the Fissurellidæ the same arrangement exists, but the cords are shorter and, in consequence, more condensed. In *Patella*, *Nerites*, *Cyclophora*, *Paludina*, and *Oypræa* the scalariform pedal cords always persist, but the pallial portion is isolated in the form of distinct ganglia; in other Gasteropods the pedal cords, like the pallial, are condensed in the form of ovoid ganglionic masses.—*Comptes Rendus*, 1897, t. cxxiv. pp. 695-697.

* According to Herren Thiele and Plate numerous anastomotic nerves attach the pallial to the pedal cords in certain Placophores; this is a first step towards the concrescence realized in *Pleurotomaria*.

† As Herren von Jhering and Bütschli have shown, the pallial cords of Placophores are nothing more than the pallial ganglia fused with the great pallial nerve. As in other Gasteropods, each great pallial nerve anastomoses above the intestine with its fellow of the opposite side.

THE ANNALS

MAGAZINE OF NATURAL HISTORY.

AND

[SIXTH SERIES.]

No. 114. JUNE 1897.

LX.—*Note on a Cast of the Brain-cavity of Iguanodon.*
By CHAS. W. ANDREWS, B.Sc., F.G.S., Assistant in the
British Museum (Natural History).

[Plate XVI.]

THE brains of certain of the American Dinosaurs have been figured and briefly described by Professor Marsh, but, so far as I am aware, the only account of the structure of this organ in a European form is that given by Hulke in a paper published in the 'Quarterly Journal of the Geological Society' for 1871. The specimen* there described is the cranial portion of the skull of a large reptile which the author regarded as probably belonging to a species of *Iguanodon*. This fragment, which was found on the shore near Brook Point in the Isle of Wight, has lately been presented to the British Museum by Mrs. Hulke, and a careful comparison of it with the cast of a complete skull of *Iguanodon bernissartensis* shows that its reference to a member of that genus is no doubt correct. The form of the occipital condyle and *foramen magnum* are precisely similar in the two specimens, and, in fact, allowing for the fracturing and rolling to which the fragment in question has been subjected, it is almost identical in its structure with the corresponding portion of

* This specimen has also been noticed by Prof. H. G. Seeley in the 'Popular Science Review' (vol. xix. 1880, p. 48), one of Hulke's figures being reproduced on plate ii. fig. 2.

the Belgian skull. Its dimensions, however, are considerably smaller, and since the sutures between the bones of the *basis cranii* are closed, it no doubt belonged to an adult individual, probably of the type species, *I. Mantelli*.

Since this interesting fragment has been in the Museum a plaster cast of the cranial cavity has been prepared, which seems worthy of description, because it gives a clearer idea of the form of the brain than can be gathered from the description and figures of the specimen itself.

As Hülke remarked in the paper referred to above, the form of the brain in reptiles can only be deduced approximately from casts of their brain-cavity, since in these animals it fills that cavity less completely than in the higher vertebrates, though to a greater extent than in amphibians and fishes. But judging from the remarkable completeness of the cranial walls in this specimen, it seems possible that the brain may have been more closely invested in bone than in other reptiles, and that consequently the shape of the cast may give a fairly accurate idea of its general form.

The olfactory lobes were either very small or perhaps pedunculate. The space which they, or more probably their basal portion, occupied is entirely filled with ironstone, so that the only trace of them in the cast is a slight angular projection from the middle of the antero-ventral border of the cerebral hemispheres (*ol.*).

The hemispheres (*c*) themselves are of moderate size: their anterior face is abruptly truncated and is only slightly convex. In vertical section the conjoined hemispheres were oval in outline, the long axis of the oval being horizontal: their greatest width is immediately behind their anterior face, at which point they formed prominent lateral lobes and measured about 62 mm. in width. Their dorsal and ventral surfaces are nearly straight and parallel in a longitudinal direction. On the ventral surface about an inch behind the anterior extremity there is a prominence, the *optic chiasma* (*op.c.*), from which diverge outwards and forwards the roots of the optic nerves (*II.*). Immediately behind this and arising from the floor of the *thalamencephalon* is the *infundibulum*, to the lower end of which is attached the pituitary body (*pit.*). This, so far as can be gathered from the cast of the fossa which it occupied, was relatively of very large size: its general form and relations are shown in the figures. Its ventral surface, which slopes obliquely downward and backward, is quadrate in outline; the prominent posterior angles mark the position of the foramina by which the internal carotids (*car.*) enter the skull, while the exact form

of the anterior region cannot be determined, the walls of the fossa being there deficient, owing to the presence on either side of a large irregular vacuity. This opening corresponds to that occurring in the same position in the skull of the crocodile, where it can be seen to be an irregular interval between the basi- and ali-sphenoid bones. The posterior surface of the pituitary body is nearly vertical and is triangular in outline.

On each side of the infundibulum there is in the cast a projecting process (III.), which marks the point of exit of the third (oculo-motor) nerve*.

Behind the infundibulum the ventral surface of the brain is furrowed by a broad transverse depression which is occupied by the thick posterior clinoid ridge, and marks the division between the mid- and hind-brain.

Turning again to the upper surface, we find that immediately behind the region occupied by the cerebral hemispheres the cranial cavity undergoes a great increase in height, and at the same time is much narrowed from side to side, particularly in its upper portion. The cast of the chamber thus formed (*cb.*) shows a pointed elevation which rises high above the hemispheres, and is so much compressed laterally that its superior surface is reduced to a mere rounded ridge. On each side of this prominence there is a strong ridge which extends downward and forward from a little behind and below its apex to a point a little in front of and above the roots of the trigeminal nerve.

This portion of the cranial cavity was no doubt occupied in life by the optic lobes and the cerebellum. In the cast itself, however, no indication of the form and position of the former is visible, and probably, therefore, they were comparatively small, or, at any rate, did not project sufficiently to impress the walls of the cranial cavity. The cerebellum, on the other hand, was large, and the oblique ridges on its sides above referred to, seem to indicate that it probably possessed fairly developed lateral lobes (*ll.*); it is, however, possible that they may merely mark the position of blood-sinuses. Behind these lobes the cast of the cerebellar chamber is slightly con-

* It should be noted that the projections on the cast, which are marked with the numbers of the cranial nerves, do not necessarily indicate the points of origin of those nerves, but merely the position of the foramina by which they passed out of the skull. In most instances, of course, the point of exit is nearly opposite the place of origin; but in the present case (that of the oculo-motor root) the nerve no doubt arose not in the position shown in the cast, but from the floor of the thalamencephalon behind the infundibulum.

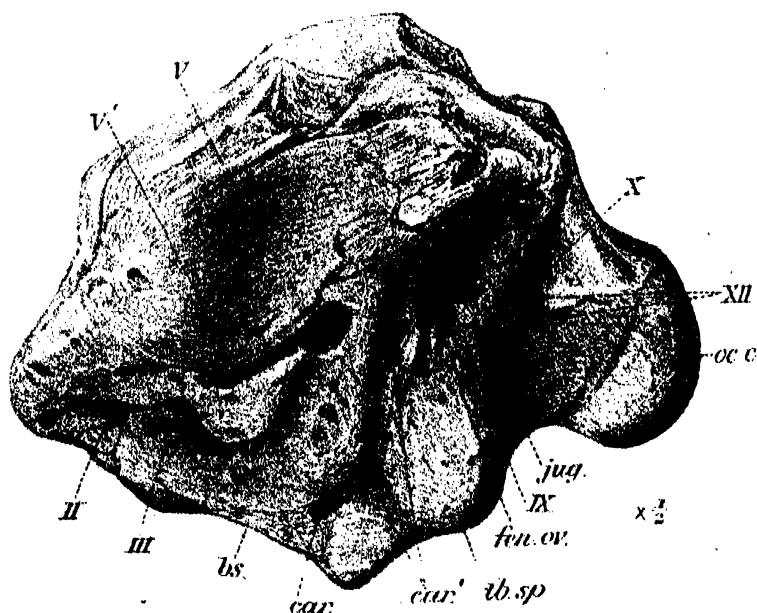
cave on either side, the concavities indicating the projection inwards of the auditory region of the skull.

The ventral region of the *medulla oblongata* (*med.*) is bounded anteriorly by the transverse groove above mentioned. Longitudinally its ventral surface is at first convex and posteriorly concave; from side to side it is convex throughout its length, the mid-ventral line being marked by a slight ridge. Anteriorly the sides of the cast of the medullary region pass up into the cerebellar prominence; in its middle portion its upper and lateral surfaces are impressed by the prominent auditory region. Posteriorly it widens out considerably and is roughly triangular in section, the angles of the triangle being rounded and corresponding to the mid-ventral ridge and the supero-lateral borders; the upper surface of this posterior region is convex. The cast no doubt gives an accurate idea of the actual form of the medulla so far as its ventral and lateral portions are concerned; but it is probable that dorsally there was a considerable space between the overhanging cerebellum and the upper surface of the medulla, so that here the real shape of the latter is not shown, no trace of the position of the fourth ventricle and other structures being seen. Further back, however, where it is about to pass into the spinal cord, it probably nearly or quite filled the cranial cavity, and its true form is therefore shown by the cast.

The determination of the roots of the cranial nerves arising from the medulla presents some difficulties, but by comparison with the crocodilian brain, and by examining the relations of the various foramina to one another and to the surrounding structures, it has been possible to determine most of them with a considerable degree of certainty. On the whole, these agree with the determinations of Hulke, who, however, employs the older terminology of Willis in his description.

On the ventral surface of the medulla close to its anterior end is a slight prominence, which probably marks the point of origin of the *abducens* (VI.). Above and a little behind this on the side wall of the medulla is the large root of the trigeminal (V.). This passes out of the skull by a very large foramen which opens externally into a fossa, from which a deep channel runs forward along the inner wall of the orbit, and, no doubt, lodged the ophthalmic branch (V'). Behind the trigeminal foramen the skull-wall is perforated by a small opening, which enlarges towards the outside and is continued on the side of the cranium as a well-marked groove (*car.*?) which runs downward and somewhat forward. Its lower end passes round to the external opening by which the

internal carotid entered the pituitary fossa. From the relations of this groove, which is bounded anteriorly by a well-defined rounded ridge, I am led to conclude that it probably lodged a branch of the carotid which entered the skull by the foramen at its upper end.



Side of cranium of *Iguanodon*, showing the various foramina. $\frac{1}{2}$ nat. size.

bs., basisphenoid; *car.*, carotid foramen; *car'*, (?) channel for branch of carotid; *fen.ov.*, fenestra ovalis; *jug.*, (?) foramen for branch of jugular vein; *occ.*, occipital condyle; *tb.sp.*, tuberculum sphenoccipitale. The foramina for the nerves are marked:—II., optic; III., oculo-motor; V., trigeminal; V', channel for the ophthalmic branch of the trigeminal; IX., glossopharyngeal; X., vagus; XII., hypoglossal.

Returning again to the cast, we find some 5 mm. behind the base of the fifth nerve a blunt prominence, which fills a depression in the skull-wall below and in front of the convex otic mass; no foramen can be seen to pass out of the skull at this point, and there can be no doubt that this prominence marks the point of origin of the auditory nerve (VIII.), and perhaps the facial (VII.) may arise with it. The next root lies 15 mm. behind the eighth and at a somewhat lower level; this seems to be the glossopharyngeal (IX.). Its foramen is

small; it runs upward and outward, reaching the exterior below and a little behind the *fenestra ovalis* (f.o.). About 1 cm. above and behind the root of the ninth is the large vagus root (X.), which passes out of the skull by a passage which, shortly after leaving the cranial cavity, forks, one branch running backwards and outwards in the same direction as the common base, the other directed forward and outward at right angles to the first. The latter opens behind and below the *fenestra ovalis* at the bottom of the same depression in the skull-wall; the former just behind the prominent oblique ridge forming the hinder boundary of the tympanic depression. This posterior branch probably transmitted the vagus (X.), and a considerable enlargement of its calibre just external to the fork probably indicates the position of the ganglion. As to what passed through the anterior branch there is some doubt, but it may be suggested that it transmitted a branch of the jugular vein (woodcut, *jug.*). About 15 mm. behind and at the same level as the roots of the ninth and tenth respectively, are two nerve-roots, of which the upper is much the larger. These pass into the cranial wall by two foramina, about 7 mm. apart, leading into passages which run outward and backward, converging so that they have opened close together in a common depression (woodcut, XII.). These nerve-roots, I believe, both belong to the hypoglossal (XII.), but perhaps the spinal accessory may also have passed out of the skull by one of the foramina of which these prominences are the casts.

It will be seen that the determination of the regions of this brain here adopted differs somewhat from that given by Marsh in some of his figures of this organ in the American Dinosaurs, the chief difference being that while he regards the middle prominence as representing in most cases a cast of the optic lobes, I think that these probably did not project far enough to leave any traces in a cast of the brain-cavity, the enlarged middle chamber of which was mainly occupied by the cerebellum. In the crocodile certainly a cast of the brain-cavity gives no idea of the form of the optic lobes. Marsh's figure* of the brain of *Ceratopsaurus nasicornis*, in which the optic lobes are marked as lateral structures not appearing on the dorsal surface of the brain, probably most nearly represents the actual condition of things. In the figure of the brain of *Claosaurus annectens* on the same plate the nerve-roots marked agree in the main with the interpretation

* Marsh, "The Dinosaurs of North America" (Sixteenth Annual Report of the U.S. Geological Survey 1896), pl. lxxvii. fig. 2.

here adopted. The brain in this Dinosaur seems to resemble that of *Iguanodon* more closely than any other of which figures have been published.

Some measurements of this specimen are appended :—

	millim.
Greatest width of cerebral hemispheres	62
" height	46
" " at cerebellar prominence.....	69
" width	88
Depth of pituitary body from base of infundibulum ..	31
Width between roots of trigeminal	36
Width of medulla at vagus root	30
Height	38.

EXPLANATION OF PLATE XVI.

Brain of *Iguanodon*, $\frac{3}{4}$ natural size :

1. From above.
2. From side.
3. From below.

car., point of entry of the internal carotids into the pituitary fossa ;
c., cerebral hemispheres ; *cb.*, cerebellum ; *ll.*, lateral lobe of cerebellum ;
med., medulla ; *ol.*, base of olfactory lobes ; *op.c.*, optic chiasma ; *pit.*,
 pituitary body.

The Roman numerals refer to the numbers of the cranial nerves.

LXI.—*Ostracoda from the Chara-marl of Hitchin, Herts.*

By FREDERICK CHAPMAN, A.L.S., F.R.M.S.

[Plate XV.]

THE *Chara*-marl or "freshwater bed" of Hitchin, Herts, is so remarkably rich in *Ostracoda* that it appears desirable to put upon record more detailed information regarding them than has been attempted up to the present time.

These *Ostracoda* of Hitchin have already been referred to in a note by Messrs. Jones and Sherborn, in 1887, on a collection made by W. Hill, Jun., Esq., F.G.S.* The four species there recorded are *Cypris incongruens*, Ramdohr ; *Scottia Browniana* (Jones) ; *Erpetocypris reptans* (Baird) ; and *Candona candida* (Müller).

The same authors subsequently † note an additional species from the Hitchin beds—*Cypridopsis vidua* (Müller) ; whilst for the previously recorded *Cypris incongruens* they substitute *Candona pubescens* (Koch) ‡.

* Geol. Mag. dec. iii. vol. iv. p. 459.

† Suppl. Monogr. Tert. Entom. (Pal. Soc.) 1889, p. 10.

‡ *Op. cit.* p. 12.

For the material from which the species here enumerated have been extracted I am indebted to Prof. T. Rupert Jones, F.R.S., who had received it from Mr. W. Hill a long time ago. This present list contains only one species which I have not myself found, and nine species and varieties are now added to the earlier records.

The bed containing the *Ostracoda* here under notice lies upon a bed of gravel, and is itself overlain by a bed of brick-earth 20 feet thick. It is a "soft calcareous loam, of a light colour, from brown to almost white, which has been found, in other parts of the brickfield, to pass down into a dark grey or almost black deposit, fairly evenly stratified" *.

Besides the *Ostracoda*, this deposit contains numerous stems and fruits (oogonia) of *Chara*, eleven species of *Mollusca*, and the remains of bear, deer, and rhinoceros. Further details of this and the associated beds are to be found in the *Proc. Geol. Assoc.* 1896 †, the locality having been visited by the members of the above association during their excursion to Hitchin.

The sample of marl examined was exceedingly rich in *Ostracod* valves; they are very fragile and require some care in the extraction. The process of washing the marl and separating the organisms is best carried out by submerging a sieve, containing some of the marl, under water, the sieve having meshes fine enough to retain the minute fossils, and from time to time agitating the sieve vertically as well as in a horizontal and circular direction.

The following is a descriptive list of the *Ostracoda* from the deposit at Hitchin as far as at present known. For valuable help in the writing of this account I tender my sincere thanks to Prof. Rupert Jones, F.R.S.

Family Cyprididae.

Genus CYCLOCYPRIS, Brady and Norman.

Cyclocypris lavis (O. F. Müller).

(Pl. XV. figs. 1, 2.)

Cypris lavis, Müller, 1785, *Entomostraca*, p. 52, pl. iii. figs. 7-9.

Monoculus ovum, Jurine, 1829, *Hist. des Monocles*, p. 179, pl. xix. figs. 18, 19.

Cypris ovum, Jones, 1856, *Monogr. Tert. Entom.* p. 14, pl. i. figs. 4 a, b; Brady, Crosskey, and Robertson, 1874, *Monogr. Post-tert. Entom.* p. 125, pl. i. figs. 29-31.

* *Proc. Geol. Assoc.* vol. xiv. p. 416.

† Vol. xiv. pp. 416-419.

Cypria lævis, Brady and Norman, 1889, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 60.

Cyclocypris lævis, Brady and Norman, 1896, *op. cit.* vol. v. p. 718.

The species is fairly common in the "freshwater bed" of Hitchin. It is a common form in this country in fresh and brackish water.

Cyclocypris globosa (G. O. Sars).
(Pl. XV. figs. 3, 4.)

Cypria globosa, G. O. Sars, 1863, Om en i Sommeren 1862 foretagen Zoologisk Reise i Christianias og Trondhjems Stifter, p. 27.

Cypria cinerea, Brady, 1868, Monogr. Rec. Brit. Ostrac. p. 374, pl. xxiv. figs. 39-42, pl. xxxvi. fig. 7.

Cyclocypris globosa, Brady and Norman, 1889, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 71, pl. xi. figs. 10-18, pl. xiv. figs. 1, 2.

The discovery of this species in the Hitchin deposits is of much interest, for it is quite a northern species, having been recorded from fossil deposits in Scotland; and as a recent form it is still found living in the lochs and pools of the border counties of England, in Scotland, and in Norway. The species is by no means uncommon at Hitchin.

Genus SCOTTIA, Brady and Norman.

Scottia Browniana (Jones).

Cypria Browniana, Jones, 1850, Ann. & Mag. Nat. Hist. ser. 2, vol. vi. p. 25, pl. iii. fig. 1; 1850, Monogr. Tert. Entom. p. 13, pl. i. figs. 1a-d.

This is also a northern species. Mr. T. Scott found it living in pools in the island of Bute (*Brady and Norman*). It was found fossil at Clacton, Essex, by Professor Rupert Jones, and since recorded by him from Hitchin and from Sidestrand, Suffolk, and Chesilton, Dorset.

Genus CYPRIS, Müller.

Cypria virens (Jurine). (Pl. XV. figs. 5, 6.)

Monoculus virens, Jurine, 1820, Hist. des Monocles, p. 174, pl. xviii. figs. 15, 16.

Cypria virens, Zaddach, 1844, Syn. Crust. Pruss. Prod. p. 35; Brady and Norman, 1889, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 74.

A common and widely distributed form, and as a recent species inhabiting "grassy pools and ditches which dry up in the summer" (*Brady and Norman*).

Only one valve of this species was found in the marl from Hitchin.

Genus *ERPETOCYPRIS*, Brady and Norman.*Erpetocypris reptans* (Baird).

(Pl. XV. figs. 7, 8.)

Cypris reptans, Baird, 1835, Trans. Berwickshire Nat. Club, vol. i. p. 99, pl. iii. fig. 11.*Candona reptans*, Baird, 1845, *op. cit.* vol. ii. p. 153; and Nat. Hist. Brit. Entom. 1850, p. 160, pl. xix. fig. 3.*Cypris reptans*, Brady, Crosskey, and Robertson, 1875, Monogr. Post-tert. Entom. p. 128, pl. ii. figs. 31, 32.*Erpetocypris reptans*, Brady and Norman, 1889, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 84, pl. xiii. fig. 27.

E. reptans is a common British species and its European distribution is wide. As a fossil it has been found in strata as old as the Weybourn Crag. In the post-Tertiary bed of Hitchin it is common and often of large size, some of the valves measuring as much as 3.3 millim. in length.

Genus *PIONOCYPRIS*, Brady and Norman.*Pionocypris vidua* (O. F. Müller).

(Pl. XV. figs. 9, 10.)

Cypris vidua, Müller, 1785, Entom. p. 55, pl. iv. figs. 7-9.*Cypridopsis vidua*, Brady, 1868, Monogr. Rec. Brit. Ostrac. p. 375, pl. xxiv. figs. 27-36, 46.*Pionocypris vidua*, Brady and Norman, 1896, Sci. Trans. R. Dubl. Soc. ser. 2, vol. v. p. 726, pl. lxiv. fig. 19.

This species has been found as a post-Tertiary fossil in the Fen district, and it is common as a freshwater form in England and Europe generally. At Hitchin this species is not uncommon.

Genus *ILYOCYPRIS*, Brady and Norman.*Ilyocypris gibba* (Ramdohr).

(Pl. XV. figs. 11, 12.)

Cypris gibba, Ramdohr, 1808, Magaz. d. Gesellsch. naturforsch. Freunde zu Berlin, Quartal ii. p. 91, pl. iii. figs. 13, 14, 17.*Ilyocypris gibba*, Brady and Norman, 1889, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 107, pl. xxii. figs. 1-5; *ibid.* 1896, vol. v. p. 727, pl. lxviii. figs. 20, 21.

This species, well known as a recent form, is also known from the Hamstead beds (Oligocene) of the Isle of Wight, and it is common as a post-Tertiary fossil in England and Scotland.

At Hitchin only one well-differentiated specimen of *I. gibba* was found, and in this the principal tubercle is prominent and recurved.

Ilyocypris Bradii, G. O. Sars.

(Pl. XV. figs. 13, 14.)

Ilyocypris Bradii, G. O. Sars, 1890, Oversigt af Norges Crustaceer, II. Branch. Ostrac. Cirrip., Christ. Vidensk. Selsk. Forhand. p. 50; Brady and Norman, 1896, Sci. Trans. R. Dubl. Soc. ser. 2, vol. v. p. 728, pl. lxiii. figs. 22, 23, pl. lxviii. figs. 18, 19.

The commoner form of this genus in the Hitchin deposit appears to be the non-tuberculate type defined by G. O. Sars under the above name, of which three valves were found.

Genus CANDONA, Baird.

Candona pubescens (Koch).

(Pl. XV. figs. 15-17.)

Cypris pubescens, Koch, 1837, Deutschlands Crustaceen &c., Heft xi. p. 5.

Candona pubescens, Brady and Norman, 1896, Sci. Trans. R. Dubl. Soc. ser. 2, vol. v. p. 729, pl. lxiii. fig. 24, pl. lxiv. figs. 20, 21, pl. lxviii. figs. 7-9.

This is a common species in the living condition. As a post-Tertiary fossil it has been recorded from Whittlesea, the Valley-drift near Salisbury, the old land-drift at Chesilton, Portland, the gravels at Barnwell, near Cambridge, and from Hitchin. In the last-named deposit well-formed valves of the species are found, but they are not very common. There are also present several valves of the form usually described under the name of *C. albicans*, but now thought to be only the young form of *C. pubescens*.

Candona lactea, Baird.

(Pl. XV. figs. 18, 19.)

Candona lactea, Baird, 1850, Proc. Zool. Soc. Lond. p. 255, pl. xviii. figs. 25-27; Brady, 1868, Monogr. Rec. Brit. Ostrac. p. 382, pl. xxiv. figs. 55-58; Brady and Norman, 1896, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 100.

This common freshwater species, which is well known from numerous post-Tertiary deposits, is very common at Hitchin.

Candona candida (O. F. Müller).

(Pl. XV. figs. 20, 21.)

Cypris candida, Müller, 1785, Entom. p. 62, pl. vi. figs. 7-9.

Candona candida, Jones, 1857, Monogr. Tert. Entom. p. 19, pl. i. figs. 8 a-f; Brady and Norman, 1896, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 98, pl. x. figs. 20-23.

This species is very common in ponds and ditches.

As a fossil it is known from the Weybourn Crag and from most deposits of post-Pliocene age. It is common in the "freshwater bed" at Hitchin.

Candona candida (O. F. Müller), var. *tumida*, Brady and Robertson. (Pl. XV. figs. 22, 23.)

Candona candida (Müller), var. *tumida*, Brady and Robertson, 1870, Ann. & Mag. Nat. Hist. ser. 4, vol. vi. p. 16, pl. ix. figs. 13-15; Brady and Norman, 1889, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 99, pl. x. figs. 14-17.

This variety has been found commonly in rivers and dykes subject to tidal influence. It differs from the typical species, so common in fresh water, in the shortness and the tumidity of the carapace. Another distinguishing character is the rosette-like arrangement of the muscle-spots, and this is clearly seen in at least one of the valves from Hitchin. The variety is somewhat rare in that deposit.

Candona candida (O. F. Müller), var. *claviformis*, Brady and Norman. (Pl. XV. figs. 24, 25.)

Candona candida (Müller), var. *claviformis*, Brady and Norman, 1889, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 99, pl. x. figs. 1, 2.

This variety was taken in the living condition from canals and ponds.

In the Pleistocene of Hitchin this variety is not unfrequent.

Family Darwinulidæ.

Genus DARWINULA, Brady and Robertson.

Darwinula Stevensoni, Brady and Robertson.
(Pl. XV. figs. 26, 27.)

Polychæles Stevensoni, Brady and Robertson, 1870, Ann. & Mag. Nat. Hist. ser. 4, vol. vi. p. 25, pl. vii. figs. 1-7, pl. x. figs. 4-14.

Darwinella Stevensoni, Brady, Crosskey, and Robertson, 1874, Post-tert. Entom. p. 141, pl. ii. figs. 13-17.

Darwinula Stevensoni, Brady and Norman, 1889, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 122, pl. x. figs. 7-13, pl. xiii. figs. 1-9, pl. xxiii. fig. 6.

It is of much interest to note the occurrence of this species from Hitchin, since in the living state it is a characteristic form in the East-Anglian Fen district; and it is also found in rivers, lochs, and canals in various parts of the British Islands.

Several separate valves of *D. Stevensoni* were found in the Pleistocene deposit at Hitchin.

Family Cytheridæ.

Genus LIMNICY THERE, Brady.

Limnocythere inopinata (Baird).

(Pl. XV. figs. 28, 29.)

Cythere inopinata, Baird, 1850, Brit. Entom. p. 172, pl. xx. figs. 1, 1 a-e.

Limnocythere inopinata, Brady, 1868, Monogr. Rec. Brit. Ostrac. p. 419, pl. xxix. figs. 15-18, pl. xxxviii. fig. 9, pl. xxxix. fig. 1; Brady, Crosskey, and Robertson, 1874, Monogr. Post-tert. Entom. p. 173, pl. x. figs. 8-11; Brady and Norman, 1880, Sci. Trans. R. Dubl. Soc. ser. 2, vol. iv. p. 170.

This species is now found inhabiting ditches, lakes, and slowly running streams. It has been recorded from various post-Tertiary clays of Scotland and England.

L. inopinata is of frequent occurrence in the "freshwater" bed of Hitchin.

EXPLANATION OF PLATE XV.

- Fig. 1. *Cyclocypris lavis* (O. F. Müller). Left valve. $\times 30$.
Fig. 2. Ditto. Edge view. $\times 30$.
Fig. 3. *Cyclocypris globosa* (G. O. Sars). Left valve. $\times 24$.
Fig. 4. Ditto. Edge view. $\times 24$.
Fig. 5. *Cypris virens* (Jurine). Left valve. $\times 24$.
Fig. 6. Ditto. Edge view. $\times 24$.
Fig. 7. *Erpetocypris reptans* (Baird). Right valve. $\times 15$.
Fig. 8. Ditto. Edge view. $\times 15$.
Fig. 9. *Pionocypris vidua* (O. F. Müller). Left valve. $\times 30$.
Fig. 10. Ditto. Edge view. $\times 30$.
Fig. 11. *Ilyocypris gibba* (Ramdohr). Left valve. $\times 30$.
Fig. 12. Ditto. Edge view. $\times 30$.
Fig. 13. *Ilyocypris Bradii*, G. O. Sars. Left valve. $\times 30$.
Fig. 14. Ditto. Edge view. $\times 30$.
Fig. 15. *Candona pubescens* (Koch). Right valve. $\times 30$.
Fig. 16. Ditto. Edge view. $\times 30$.
Fig. 17. Ditto. Young form, left valve. $\times 30$.
Fig. 18. *Candona lactea*, Baird. Right valve. $\times 30$.
Fig. 19. Ditto. Edge view. $\times 30$.
Fig. 20. *Candona candida* (O. F. Müller). Right valve. $\times 20$.
Fig. 21. Ditto. Edge view. $\times 20$.
Fig. 22. *Candona candida*, var. *tumida*, Brady and Robertson. Left valve. $\times 30$.
Fig. 23. Ditto. Edge view. $\times 30$.
Fig. 24. *Candona candida*, var. *claviformis*, Brady and Norman. Right valve. $\times 20$.
Fig. 25. Ditto. Edge view. $\times 20$.
Fig. 26. *Darwinula Stevensoni*, Brady and Robertson. Right valve. $\times 30$.
Fig. 27. Ditto. Edge view. $\times 30$.
Fig. 28. *Limnocythere inopinata* (Baird). Left valve. $\times 30$.
Fig. 29. Ditto. Edge view. $\times 30$.

LXII.—*List of the Neuroptera collected by Mr. E. E. Austen on the Amazons &c. during the recent Expedition of Messrs. Siemens Bros. Cable S.S. 'Faraday,' with Descriptions of several new Species of Odonata (Dragonflies).* By W. F. KIRBY, F.L.S., F.E.S., &c.

[Plates XII. & XIII.]

MR. AUSTEN informs me that the Dragonflies are among the most abundant and conspicuous insects on the Amazons. He obtained a fair number of species, seven of which I have ventured to describe as new in the present paper. I have also included in this paper two species captured by Mr. Austen in St. Vincent, Cape Verd Is., and have taken the opportunity of describing two more Amazonian species previously in the collection of the British Museum, which Mr. Austen did not meet with, though they seem to be not uncommon in localities which he visited. Probably different species are found at different times of year. The St. Vincent species, and the Amazonian species here described, though not obtained by Mr. Austen, are distinguished by being placed in brackets, which was thought better than noticing them separately or placing them in footnotes.

Nearly all the Dragonflies obtained were Libellulinæ, though one or two representatives of other families were brought home.

Among the few captures of other groups of Neuroptera were one or two interesting species of Epheméridæ.

Table of Captures.

	St. Vincent.	Amazons.	New.
ODONATA.			
Libellulidæ:			
Libellulinæ	2	34	6
Æschnidæ:			
Gomphinæ		2 (P)	1
Æschuinæ		5	
Agrionidæ:			
Cœnagrioninæ—			
Pseudostigmatina ..		1	
Normostigmatina ..		4	
Other families of Neuroptera.			
Epheméridæ		2	
Termitidæ		1	
Osmylidæ		1	

One or two species taken on board the S.S. 'Faraday' are marked (F.) after the locality.

Order NEUROPTERA.

Suborder O DON A T A (DRAGONFLIES).

Libellulidæ.

LIBELLULINÆ.

Genus THOLYMIS, Hagen.

Tholymis citrina.

Tholymis citrina, Hagen, Stett. ent. Zeit. xxviii. p. 218 (1867).

Below Breves, Island of Marajo (F.), Jan. 12, 1896.

A single dark-coloured (adult) male specimen.

Hagen described this species from Cuba. The specimens previously in the British Museum collection were all received from the Lower Amazon district (Pará, Santarem, Tapajos), but none of them are so highly coloured as the specimen from Breves.

[Genus PANTALA, Hagen.

Pantala flavescens.

Libellula flavescens, Fabricius, Ent. Syst. Suppl. p. 285 (1798).

Porto Grande, St. Vincent, Cape Verd Is., Dec. 26, 1895.

One specimen of this almost cosmopolitan species. There are specimens in the British Museum from Pará and Santarem, though Messrs. Austen and Cambridge do not appear to have met with it on the Amazons.]

Genus TRAMEA, Hagen.

Tramea abdominalis.

Libellula abdominalis, Rambur, Ins. Névr. p. 37 (1842).

Santarem, Jan. 30, 1896.

Two specimens.

There are also specimens in the British Museum from Pará, "Brazil" (Rio?), Jamaica, Santa Lucia, and Grenada.

Tramea basalis.

Libellula basalis, Burm. Handb. Ent. ii. p. 852. n. 25 (1839).

Santarem, Jan. 28; Manaos, Feb. 2; Mosqueiro, March 6, 1896.

Four specimens obtained.

Previously in the British Museum from Pará and Fernando Noronha.

Tramea brasiliana.

Tramea brasiliana, Brauer, Verh. zool.-bot. Ges. Wien, xvii. p. 812 (1867).

Obydos, Feb. 2, 1896.

One specimen.

The specimens previously in the British Museum are from "Brazil" (Rio?) and Pará.

Genus TAURIPHILA, Kirb.

Tauriphila iphigenia.

Tramea iphigenia, Hagen, Stett. ent. Zeit. xxviii. p. 230 (1867), xxx. p. 262 (1869).

Obydos (F.), Feb. 2, 1896.

Previously in the Museum from Pará and the Tapajos.

Tauriphila nycteris.

Tauriphila nycteris, Karsch, Berl. ent. Zeitschr. xxxiii. p. 351 (1890).

A fine male from Obydos, Feb. 2, 1896.

The legs in both sexes are rufo-testaceous, and the abdomen is without black spots towards the extremity. In the male the ferruginous space on the hind wings resembles that of *Tramea basalis*; in a female from Brazil (Rio?) it is narrower. Karsch describes a female from Bahia. The male has 15 antecubital cross-nervules on the fore wings, the female only 13.

Genus MIATHYRIA, Kirb.

Miathyria marcella.

Libellula marcella, De Selys, Ramon de la Sagra, Hist. Cuba, Ins. p. 452 (1857).

Santarem, Jan. 27-31; Obydos, Feb. 2; Manaos, Feb. 14, 1896.

Appears to be a very common species on the Lower Amazons, especially at Santarem (E. E. A.). Mr. Austen did not meet with *M. pusilla*, Kirb., which I am now inclined to think is synonymous with *M. simplex*, Ramb.

[*Miathyria flavescens*, sp. n. (Pl. XIII. fig. 2.)

Long. corp. 31-34 millim.; exp. al. 50-56 millim.; long. pter. 1.50 millim.

Eyes connected by a moderately long suture. Head testaceous, sometimes greenish above, frontal tubercle and upper part of clypeus metallic blue; mandibles blackish; occipital triangle cupreous. Thorax black, with a broad green band on each side, obsolete in front; pleura green, separated into spots and bands by broad black stripes on the sutures. Abdomen black, with two orange stripes, interrupted by the carinæ and incisions on each side, the upper ones narrow, the lower ones broad (these are frequently nearly obliterated in the males). Legs rufo-testaceous towards the base and blackish at the extremity, clothed with long slender hairs; the hind femora furnished with short blunt tubercles beneath, and the middle femora with short sharp serrations. Anal appendages as long as the last segment, much arched, slightly thickened and hairy towards the extremity; middle appendage very broad and flattened towards the base and pointed at the extremity, as long as the lateral ones. Abdomen slenderest in the middle, somewhat thickened towards the extremity.

Wings hyaline, tinged with greenish yellow; fore wings with 10-11 antenodal cross-nervules (the last not continuous) and 5-6 postnodals; pterostigma dark brown, equally long on the fore and hind wings; sectors of the arculus distinctly stalked; triangle free, followed by two rows of cells, only increasing towards the hind margin; one subtriangular space, sometimes divided by a vertical nervule on one side; nervures fuscous, membranule small, whitish. Claws bifid.

The female varies somewhat in the colour of the wings, which are more deeply tinged with sulphur-yellow than in the male, especially towards the anal angle of the hind wings, whereas the tips of the wings are of a more smoky colour, the centre of the wings being sometimes clear hyaline. The appendages on the four hind legs have more of the appearance of short stiff bristles than in the male.

Hab. Santarem (Bates).

Described from three males and three females.

I take the opportunity of describing this very distinct species in the present paper, though it was not among Mr. Austen's captures.]

Genus DIASTATOPS, Rambur.

Diastatops dimidiata.

Libellula dimidiata, Linn. Syst. Nat. (ed. x.) i. p. 545. n. 14 (1758).

Pará, Jan. 10 (*E. E. A.*); W. end of Paraná de Buyassu, Jan. 17, 1896 (*H. W. Marsh.*).

Previously in the Museum from Pará.

Ann. & Mag. N. Hist. Ser. 6. Vol. xix.

*Diastatops obscura.**Libellula obscura*, Fabr. Syst. Ent. p. 422. n. 10 (1775).

West end of Paraná de Buyassu, Jan. 15; Manaos, Feb. 11.

"The patch at the base of the hind wing and the abdomen (except tip) brilliant scarlet when alive" (*E. E. A.*). Both this and the following, which Mr. Austen always found together and thinks are the same species *, are very abundant.

*Diastatops pullata.**Libellula pullata*, Burm. Handb. Ent. ii. p. 854. n. 34 (1839).

West end of Paraná de Buyassu, Jan. 15 and 18; Manaos, Feb. 11, 1896.

Genus ZENITHOPTERA, de Selys.

*Zenithoptera fasciata.**Libellula fasciata*, Linn. Syst. Nat. i. p. 545. n. 12 (1758).

Pará, Jan. 4; Obydos, Feb. 2; Mosqueiro, Rio de Pará, March 7, 1896.

*Zenithoptera americana.**Libellula americana*, Linnæus, Syst. Nat. (ed. x.) i. p. 545. n. 16 (1758).

Manaos, Feb. 11; Gurupá, Feb. 22, 1896.

"This species settles on the tips of dead twigs, from 5 to 10 feet from the ground, droops its wings downwards and forwards, and thus looks exactly like a tuft of dead leaves. The insects will remain motionless in this way for several minutes." (*Note by E. E. A.*, Feb. 22, 1896.).

Genus PERITHEMIS, Hagen.

*Perithemis lais.**Perithemis lais*, Perty, Del. Anim. Art. p. 125, pl. xxv. fig. 2 (1834).

Pará, Jan. 7, 1896.

One specimen only in Mr. Austen's collection.

"Fairly common, but very difficult to catch; fond of settling on grass-blades projecting from pools" (*E. E. A.*).

Perithemis Austeni, sp. n.

(Pl. XII. fig. 4 ♂, fig. 5 ♀.)

Long. corp. 24 millim.; exp. al. 38 millim.; long. pter. 2.2-3 millim.

* This is also Mr. M'Lachlan's opinion.

Closely allied to *P. bella*, Kirb., but slightly larger. The male is tinged with deep orange-yellow, with only the apical area of the fore wings subhyaline; the pterostigma (which is longer on the hind wings than on the fore wings) is red, bordered below with a black line; the triangle of the fore wings is sometimes traversed and sometimes open, and is followed by 2 or 3 cells, and there are 3 cells in the subtriangular space.

In the female the wings are hyaline, the anterior wings with the nodus marked with black and followed by a slight yellow suffusion, and the lower subcostal space slightly and brokenly tinged with yellow; the hind wings are hyaline, with a yellow suffusion, with no brown shade in the middle, extending from a little beyond the triangle nearly to the pterostigma or the costa, and to the level of its middle on the inner margin. The triangle on the fore wings is open, and the subtriangular space consists of one cell only.

In most other characters this insect agrees with *P. bella*; but the series of *P. bella* from Santarem and the five specimens of *P. Austeni* from Manaos appear to exhibit fairly constant characters.

Manaos, Feb. 10 and 11, 1896.

Genus TRITHEMIS, Brauer.

Trithemis pulla.

Libellula pulla, Burm. Handb. Ent. ii. p. 855. n. 41 (1839).

Trithemis pulla, Kirb. Ann. & Mag. Nat. Hist. (6) xiv. p. 263 (1894).

Pará, Jan. 10; Breves, Jan. 13; Gurupá, Jan. 23; Santarem, Jan. 30; Obydos, Feb. 2; Mosqueiro, March 7, 1896.

One of the commonest of the Amazonian Dragonflies.

Trithemis Erichsoni.

Trithemis Erichsoni, Kirb. Ann. & Mag. Nat. Hist. (6) xiv. p. 263 (1894).

Libellula unimaculata, Erichs. Schomb. Brit. Guiana, iii. p. 584 (1848).

Breves, Lower Amazons, Jan. 13; W. end of Paraná de Buyassu, Jan. 18 and 19; Gurupá, Lower Amazons, Jan. 23 and Feb. 22; Manaos, Feb. 2; Mosqueiro, Rio de Pará, March 10.

Many specimens.

Trithemis umbrata.

Libellula umbrata, Linn. Syst. Nat. (ed. x.) i. p. 545. n. 18 (1759).

Gurupá, Jan. 23; Santarem, Jan. 30; Obydos, Feb. 2;

Macapá, Feb. 25; Chaves, Feb. 27; Breves, March 1; Mosqueiro, Rio de Pará, March 6, 1896.

Several specimens of this common and rather variable species.

[Genus CROCOTHEMIS, Brauer.

Crocothemis erythræa.

Libellula erythræa, Brullé, Expéd. de Morée, iii. (1) p. 102, pl. xxxii. fig. 4 (1862).

Porto Grande, St. Vincent, Cape Verd Is., Dec. 26, 1895.

Three fine males and one female. A well-known South-European species.]

Genus ORTHEMIS, Hagen.

Orthemis ferruginea.

Libellula ferruginea, Fabricius, Syst. Ent. p. 423. n. 19 (1775).

Breves, Jan. 13; W. end of Paraná de Buyassu, Jan. 16; Obydos, Feb. 2; Manaos, Feb. 11.

The specimen (male) from Breves bears a label—"Colour of living insect: thorax plum-purple, abdomen deep scarlet. Only found over swampy ground; common, but very wary and difficult to catch.—E. E. A."

A common species throughout the warmer parts of America.

Genus ANATYA, Kirb.

Anatya guttata.

Libellula guttata, Erichs. Schomb. Brit. Guiana, iii. p. 584 (1848).

Anatya anomala, Kirb. Trans. Zool. Soc. Lond. xii. p. 338, pl. liii. fig. 9, pl. lvii. fig. 7 (1889).

W. end of Paraná de Buyassu, Jan. 19, 1896; Gurupá, Feb. 22, 1896.

A damaged pair, taken *in coitû*, from the first locality; one specimen from the latter.

Genus URACIS, Ramb.

Uracis imbuta.

Libellula imbuta, Burn. Handb. Ent. ii. p. 850. n. 9 (1839).

Two miles below Pará (the commonest species), Jan. 7; Breves, Jan. 13, 1896.

The male of this species is pulverulent blue, with the head black and only the lower mouth-parts testaceous, but the occipital triangle is smooth and red. The wings are tipped

with brown nearly to the base of the pterostigma. The female is dark blackish brown, with only the thorax slightly mottled with testaceous; the head is almost wholly testaceous. The neuriation varies considerably, but the triangles of all the wings are always traversed; the number of cross-nervules in the lower basal cell varies and also the presence or absence of supratrangular nervules. In the specimens from Breves the brown tip of the fore wings is narrower than in those from Pará; there are four males and one female from Pará and a pair (♂ ♀) from Breves.

This species is intermediate between *U. quadra*, Ramb., and *U. fastigiata*, Burm., in the width of the dark tips to the wings, but differs from both by its uniform unspotted colour. The British Museum possesses a series of specimens from Trinidad which I refer provisionally to *U. quadra*. The abdomen is spotted in both sexes, the apex of the wing is but slightly browned, there are no supra-triangular nervules, but there are two nervules in the lower basal cell on the fore wings and three on the hind wings, and the triangle of the hind wings, which is traversed, corresponds with the arculus, whereas it is generally rather shorter in *U. imbuta*.

There seem to be several very closely allied species of *Uracis*, or else a number of imperfectly segregated varieties. There are several specimens in the Museum which I can neither include in the described species, nor separate on characters tangible enough to admit of the insects being described as distinct without a larger amount of material.

It should be noted that Rambur's figure of *U. quadra*, though unsatisfactory and inaccurate, represents the triangle of the hind wings as followed by three rows of cells, increasing. No specimen of *Uracis* before me has more than two.

Uracis Siemensi, sp. n. (Pl. XII. fig. 3.)

Long. corp. 32 millim.; exp. al. 55 millim.; long. pter. 3 millim.

Male.—Pulverulent blue; head and face greenish yellow, occiput black above, vertex blue-black to before the ocelli; mandibles and sutures of the mentum black. Upper anal appendages as long as the eighth segment, pointed and rather sharply curved upwards; lower appendage about two thirds as long as the others, and truncated at the extremity.

Wings rather narrow, yellowish hyaline; pterostigma blackish, rather thick, covering nearly three cells. Fore wings with 12-13 antenodal cross-nervules (the last not con-

tinuous) and 9-10 postnodal cross-nervules (9 on the right side, 10 on the left), the first not continuous. Fore wings with the triangles rather small, very oblique, traversed, and extending considerably beyond those of the hind wings; subtriangular space composed of three cells; triangle followed by one row of three cells, and then by several rows of two cells, increasing beyond the middle; no supra-triangular nervules; lower basal cell with 2-3 cross-nervules. Hind wings with the triangle small, open, not extending to the arculus, and followed by a single row of cells, increasing; no supra-triangular nervules; 4 cross-nervules in the lower basal cell.

Female.—Like the male, but testaceous, the thorax and pleura lined with black, and transversely with ripple-like brown markings from the central carina of the thorax to below the uppermost black line on the pleura; about the middle of the pleura are two black spots. Abdomen with all the carinæ black and with black blotches on the sides towards the extremity of segment 4 and those following it; the hinder segments have the dark space increasing till it covers a large part of the segments above as well as at the sides.

Wings clearer hyaline and the pterostigma brown; otherwise as in the male.

Gurupá, Jan. 23 and Feb. 22, 1896.

Two males; a female from Pará was previously in the collection.

Allied to *U. infumata*, Rambur, but in the latter species the wings are banded with purplish brown, and the anal appendages are yellow.

Genus MACROTHEMIS, Hagen.

Macrothemis celeno (?).

Libellula celeno, De Selys, Sagra, Hist. Cuba, Ins. p. 454 (1867).

Pará, Jan. 5; W. end of Paraná de Buyassu, Jan. 13, 1896.

Four males and one female. They agree fairly well with the published descriptions of *M. celeno*; but, in the absence of specimens from Cuba, I cannot feel absolutely certain of the correctness of the identification.

Genus RHODOPYGIA, Kirb.

Rhodopygia cardinalis.

Libellula cardinalis, Erichs., Schomb. Brit. Guiana, iii. p. 583 (1848).

Gurupá, Jan. 23, 1896.

"Thorax and abdomen of same colour, a brilliant scarlet"
(*E. E. A.*).

One specimen only.

Previously in the Museum from Pará.

Genus NEOCYSTA, Kirb.

Neocysta attenuata.

Libellula attenuata, Erichs., Schomb. Brit. Guiana, iii. p. 583 (1848).

Pará, Jan. 3 and 5; W. end of Paraná de Buyassu, Jan. 15 and 16, 1896.

Both sexes obtained; the female differs little from the male, except that the thorax is dull green instead of red.

Genus CANNACRIA, Kirb.

Cannacria Batesii.

Cannacria Batesii, Kirb. Trans. Zool. Soc. Lond. xii. p. 341, pl. liii. fig. 1, pl. lvii. fig. 9 (1889).

Manaos, Feb. 14, 1896.

One specimen (*E. E. A.*).

Genus LEPTHEMIS, Hagen.

Lepthemis vesiculosa.

Libellula vesiculosa, Fabr. Syst. Ent. p. 421. n. 7 (1775).

Santarem, Jan. 23-31; Itacoatiara, Feb. 7; Manaos, Feb. 10; Mosqueiro, Rio de Pará, March 8-10, 1896.

Several specimens. A widely distributed species throughout the warmer parts of America.

Lepthemis hæmatogastra.

Libellula hæmatogastra, Burmeister, Handb. Ent. ii. p. 857. n. 55 (1839).

Obydos, Feb. 2; Manaos, Feb. 14; Macapá, Feb. 25; Mosqueiro, March 7, 1896.

Previously in the Museum from Pará and Santarem.

Genus MESOTHEMIS, Hagen.

Mesothemis attala.

Libellula attala, De Selys, Sagra, Hist. Cuba, Ins. p. 445 (1857).

Obydos, Feb. 2; Parintins, Feb. 4; Itacoatiara, Feb. 7; Manaos, Feb. 14, 1896.

One specimen from each locality. The specimen from Parintins bears a note:—"In the forest, a considerable distance from the river."

Genus ERYTHEMIS, Hagen.

Erythemis peruviana.

Libellula peruviana, Ramb. Ins. Névr. p. 81 (1842).

W. end of Paraná de Buyassu, Jan. 15 and 16; Santarem, Jan. 27 and 31; Manaus, Feb. 10; Macapá, Feb. 25.

All the males taken at the first locality were immature, resembling the female in coloration. Several fully-coloured males, however, were taken at Santarem, some of which are marked "Opposite shore to the town."

Genus MICRATHYRIA, Kirb.

Micrathyria Cambridgei, sp. n. (Pl. XIII. fig. 4.)

Long. corp. 34 millim.; exp. al. 62 millim.; long. pter. 3 millim.

Male.—Head: face buff, vertex chalybeous blue, mandibles and suture of mentum black; occiput ferruginous, spotted and streaked above and on the sides with yellow. Prothorax and pleura brassy green, a short slender yellow line in front on each side, a slender line (angulated downwards in the middle) below it, and two very broad straight yellow bands on the pleura, with a narrow one between them, the hindermost covering the whole of the hinder part of the pleura. Tegulae with a small yellow spot on each, and another in front. Interlary portion of the meso- and metathorax pulverulent blue, intersected by black sutures. Abdomen shining black; a transverse green mark on each side of the front of the second segment above; a short pointed longitudinal green stripe at the base on the sides of segments 3 and 4, a small orange spot on the sides of segment 5 at the base, an orange dot on the sides at the base of segment 6, and an oblong green blotch on each side of segment 7, separated above by the central carina. Legs black; femora yellow towards the base beneath. Wings hyaline, the tips rusty brown beyond the pterostigma; nervures black, pterostigma dark reddish brown. Fore wings with 11-12 antenodal cross-nervules, the last not continuous, and 7 postnodal cross-nervules, the two first not continuous. Triangle traversed, followed by two rows of cells, increasing to three beyond the middle, and terminating in four on the hind margin; subtriangular space

rather long, and consisting of three cells. Hind wings slightly tinged with deep yellow at the extreme base, fore wings scarcely at all. Upper ulnar appendages slender, as long as the last two segments, not much longer than the lower appendage.

Breves, Jan. 13, 1896.

One specimen only.

Differs from *M. didyma*, De Selys, and other allied species, in the first row of post-triangular cells being formed of two cells only, not three.

I have named this species after Mr. Pickard-Cambridge, who accompanied Mr. Austen in his journey.

Micrathyria eximia, sp. n. (Pl. XIII. fig. 3.)

Long. corp. 22-26 millim.; exp. al. 36-37 millim.; long. pter. 2 millim.

Male.—Face pale yellow, inclining to greenish on the sides; antennal tubercle and centre of vertex metallic blue; mentum whitish, the medial line and the mandibles black. Prothorax and front of pleura metallic green; meso- and metathorax and hinder half of the pleura pulverulent blue; a broad pale yellow stripe, narrowed behind, on each side of the thorax above, and three more, partly interrupted, pale yellow stripes on each side, the uppermost narrow, slightly angulated, the others more or less obliterated by the pulverulence; tegulae pale yellow. Legs black, front femora yellowish beneath towards the base. Abdomen black, thickened towards the base and tip, with yellow lateral stripes in front of segments 3-6; on segment 7 is a much larger one on each side, separated by the dorsal carina; sometimes there is also a lateral spot at the base of segment 8. Anal appendages as long as the ninth segment, upper appendages slightly curved downwards, of nearly equal thickness throughout; lower appendage scarcely shorter than the others. Wings clear hyaline; fore wings with 7-8 antenodal cross-nervures, the last not continuous, and 5-7 postnodals, the first two not continuous; triangle not traversed, followed by two rows of cells, only increasing to three on the hind margin; subtriangular space consisting of one cell only: hind wings with the triangle not traversed and the sectors of the triangle separated at the base. One cross-nervule in the lower basal cells; no supra-triangular nervules.

Obydos, Feb. 2, 1896.

Described from four specimens.

A very pretty little species, not closely allied to any other. A male from Pará was previously in the Museum collection.

I describe below an allied species from the Amazons which was not found by Mr. Austen :—

[*Micrathyria tibialis*, sp. n.
(Pl. XIII. fig. 5 ♂, fig. 6 ♀.)

Long. corp. 23–25 millim. ; exp. al. 40–42 millim. ; long. pter. 2 millim.

Male.—Face yellow, tips of mandibles black, antennal tubercle and middle of vertex metallic blue-green. Thorax metallic blue-green ; pleura yellow, with three metallic oblique bands ; front of mesothorax with a bifid yellow mark on each side, conterminous with the yellow front of the pleura ; interalary space pulverulent blue. Abdomen black, less thickened at base and tip than in *M. eximia*, with long lateral testaceous spots on segments 3–6, and the spots on segment 7 barely separated by the narrow black carina ; anal appendages testaceous, black above at the base. Legs black, front femora yellow beneath ; hind tibiæ and sometimes a line on the others rufo-testaceous. Wings as in *M. eximia*, except that the marginal row of post-triangular cells is formed of four cells instead of three.

Female (apparently immature) with the antennal tubercles yellowish behind ; thorax, pleura, and base of abdomen varied with rufo-testaceous and yellowish, the hinder part of the thorax with a mere trace of metallic colouring above ; abdomen blackish brown, except at base, with the pale spots larger than in the male ; anal appendages testaceous ; legs blackish above, and mostly testaceous beneath, like the greater part of the underside of the body ; hind tibiæ testaceous. Wings as in the male, except that the pterostigma is paler testaceous.

Hab. Santarem (*Bates*).

Closely allied to *M. eximia*.]

Micrathyria basalis, sp. n. (Pl. XII. fig. 1.)

Long. corp. 25 millim. ; exp. al. 38 millim. ; long. pter. 2 millim.

Male.—Face blackish or deep reddish brown, sometimes with the mentum narrowly bordered before and behind with yellow ; clypeus metallic blue, with a pale yellow spot on each side ; antennal tubercle metallic blue, bordered with yellow behind ; occiput black, the hinder orbits mostly yellow ; thorax and pleura brownish yellow, speckled with black, the sutures and carinæ brown ; two or three brown or blackish spots on the pleura under the fore wings ; interalary space

greenish yellow ; abdomen testaceous yellow, with the sutures, the carinæ, and a lateral band bifid in front and interrupted on the hinder half of the segments, black ; the last four segments (except a short testaceous lateral line at the base of the first of these) wholly black, by the gradual widening of the black band over the dorsal carinæ, and the lateral black bands ; anal appendages a little longer than the ninth segment, yellow ; the lower appendage almost as long as the upper ones, and narrowly bordered with black. Wings hyaline, one cross-nervule on the lower basal cell ; triangles free ; no supra-triangular nervules : fore wings with 8-9 antenodal cross-nervules, the last not continuous, and 6-8 postnodals, the first two not continuous ; subtriangular space consisting of 3 cells (rarely 2) ; two rows of post-triangular cells, increasing ; base of fore wing stained with brown on the inner margin as far as the first cross-nervure : hind wings with the sectors of the triangle separated at the base ; base of hind wings stained with brownish testaceous for two fifths of the distance from the base to the triangle ; this space is traversed by thick black nervures, and is bordered with blackish.

Female (?) yellow, the lower border of the clypeus (broadest on the sides) and the mandibles and central line of the mentum black ; antennal tubercle and centre of vertex metallic blue ; a yellow spot in front of the eyes at the base of the antennal tubercle on each side. Thorax orange-yellow, with the carinæ reddish brown ; a large yellow spot in front above the angulated carina ; prothorax yellow above, with the sides black ; front of mesothorax yellow along the median line, and mottled with reddish brown on each side of it ; interalary space yellow, the sutures narrowly black and the sides spotted with black ; base of abdomen yellow, the sutures and carinæ at first reddish, but those at the end of the second segment and on the third segment black ; the remaining segments black, the fourth with a long yellow lateral stripe, broad at the base, the fifth with a long stripe, the sixth with a wedge-shaped one, and the seventh with a broad one, nearly meeting on the back. Anal appendages yellowish or buff. Legs black ; front femora beneath, and base of the other femora beneath, yellowish. Wings hyaline, stained with yellow at the base ; fore wings with 10 antenodal and 7-8 postnodal cross-nervules ; triangle of fore wings traversed ; otherwise the wings are as in the male.

W. end of Paraná de Buyassu, Jan. 16 ; Obydos, Feb. 2 ; Breves, March 1, 1896.

Differs a little from typical *Micrathyria* in the abdomen

being more gradually thickened at the base and only very slightly towards the tip, thus approaching *Trithemis*. The traversed cell of the fore wings in the female specimen from Breves might cause some doubt as to whether it is the true female of this species, but that one of three males from Pará, previously in the collection of the Museum, has also the triangles of the fore wings traversed by a nervure, though it does not differ otherwise from the other males of the species before me.

Micrathyria attenuata.

Trithemis (?) *attenuata*, Kirb. Trans. Zool. Soc. Lond. xii. p. 328, pl. liii. fig. 2 (1889).

Pará, Jan. 7, 8, and 10; W. end of Paraná de Buyassu, Jan. 16; Macapá, Feb. 25, 1896.

The types are from Santarom. Mr. Austen obtained several specimens of both sexes at Pará (one very brightly coloured female may have had its colours changed by cyanide), and a very dark specimen belonging to the variety with suffused wings, mentioned in the original description, from Paraná de Buyassu.

Micrathyria venusta, sp. n. (Pl. XIII. fig. 1.)

Long. corp. 35 millim.; exp. al. 57 millim.; long. pter. 3 millim.

Male.—Blue-black, face yellow, vertex purplish brown, lower mouth-parts yellowish brown, occiput black, the lower occipital part of the eyes bordered behind with a slender yellow line. Abdomen with some rather indistinct transverse testaceous markings towards the base, but the hinder part of the third segment and the front part of segments 4–7 with a longitudinal lateral testaceous stripe on each—that on the sixth is oblong and that on the seventh forms an even band across the basal upper half of the segment. Anal appendages testaceous, the upper one rather slender, pointed, and a little longer than the lower one, which is very broad and rounded at the extremity. Wings hyaline, crossed by a broad smoky-brown band, with the centres of the cells pale, from just before the level of the nodus nearly to the pterostigma; fore wings only slightly brownish at the base, but hind wings with a smoky-brown patch at the base as far as the triangle. Legs black, femora rufo-testaceous at the base and beneath. Fore wings with 10 antenodal cross-nervules, the last not continuous, and 10–11 postnodals; triangle traversed, followed by three rows of post-triangular cells,

interrupted by one or more rows of two, and increasing to four towards the hind margins; no supra-triangular nervules, only one cross-nervule in the lower basal cell; subtriangular space consisting of three cells.

Macapá, Feb. 25, 1896.

Possibly a large variety of *M. attenuata*, but in that species the band on the sixth segment of the abdomen meets on the back, and that on the seventh is smaller, and sometimes nearly obsolete. The large size of *M. venusta* gives it a superficial resemblance to *Trithemis umbrata*, Linn.

Æschnidæ.

GOMPHINÆ.

Genus CYCLOPHYLLA, De Selys.

Cyclophylla Calverti, sp. n. (Pl. XII. fig. 2.)

Long. corp. 47 millim.; exp. al. 57 millim.; long. pter. 4 millim.; long. append. anal. 2 millim.

Male.—Head green; a reddish-brown band, expanded behind on each side, covering the antennæ and ocelli; mentum bordered with yellow above, and the space between this and the mandibles ferruginous; a yellow spot on each side above the base of the mandibles. Thorax reddish brown, with two green bands, very broad in front and narrowing and converging behind; traces of a second band between this and the fore wings; pleura with three green bands, the last the broadest; below the middle they shade into yellow and ferruginous. Legs short, rufous; femora greenish yellow beneath, and shortly serrated; appendages of the second segment, and lateral lobes at the base of the abdomen large and conspicuous. Interlary space marked with a rather broad olive-green stripe, and with a conspicuous yellow spot between the bases of each pair of wings. Abdomen greenish brown at the base, and blackish from before the middle of the third segment; fourth, fifth, and sixth segments with greenish lateral spots, that on the fourth largest; seventh with a lateral green dash extending for nearly one third of its length; eighth and ninth segments slightly expanded on the lower edges; tenth segment rufo-testaceous; upper appendages black, semicircular, slightly hairy, and incurved; a strong tooth on the inner lower edge at one third of their length; tips pointed, preceded by a blunt tooth, and a lobe between this and the point. Lower appendage short, semicircular, pointed at both ends. Wings hyaline, with a slight yellowish tinge, and

black nervation; pterostigma testaceous, between black nervures. Upper triangles and lower triangle of the fore wings traversed by one nervure each; lower basal cell with one cross-nervure; one supra-triangular nervure on all the wings: fore wings with 18-19 antenodal and 10-13 postnodal cross-nervures; hind wings with 13-14 antenodals and 12-13 postnodals. Triangle of fore wings followed by two rows of cells, increasing, that of hind wings followed by one row of 3, and then by several rows of 2, increasing. Hind wings deeply excised on the inner margin; inner marginal space consisting of 4 cells.

W. end of Paraná de Buyassu, Jan. 15, 1896.

Allied to *C. diphylla*, *gladiata*, and *sordida*, De Selys, but apparently distinct from either. Appears to approach the first in the spotting of the abdomen and the others in the markings of the thorax. I have named the species after Mr. Philip Calvert, of Philadelphia, in recognition of the useful work he is doing in the Odonata.

There are three more specimens of this genus from Pará, Breves, and Manaos, respectively, which may be new, but these are immature and in poor condition, so that it is not advisable to describe them in the absence of more and better specimens.

ÆSCHNINÆ.

Genus ANAX, Leach.

Anax amazili.

Æschna amazili, Burm. Handb. Ent. ii. p. 841. n. 19 (1859).

Santarem, Jan. 31; Mosqueiro, March 7, 1896.

A species new to the Museum collection.

Genus ÆSCHNA (Illiger).

Æschna macromia.

Æschna macromia, Brauer, Verh. zool.-bot. Ges. Wien, xv. p. 906 (1865).

Near Santarem (F.), Jan. 27, 1896.

Previously in the Museum from Santarem and the Tapajos.

Genus GYNACANTHA, Rambur.

I have been criticized for making *G. trifida*, Rambur, the type of this genus, although Baron De Selys Longchamps, in

1883, restricted that name to another section. I did so on the ground that De Selys, in Ramon de la Sagra's 'Histoire de l'Ile de Cuba' (1857), quoted Rambur's definition of the genus, and described two species under it—*G. trifida*, Rambur, and *G. septima*, De Selys—an action which many entomologists would agree with me was tantamount to fixing *G. trifida* as the type of *Gynacantha*.

Gynacantha trifida.

Gynacantha trifida, Rambur, Ins. Névr. p. 210 (1842).

Mosqueiro, March 8, 1896.

Previously in the Museum from the Tapajos.

Genus ACANTHAGYNA, Kirb.

Acanthagyna nervosa.

Gynacantha nervosa, Rambur, Ins. Névr. p. 94 (1842).

Mosqueiro, March 8, 1896.

Four female specimens.

A widely distributed species in Tropical America.

Acanthagyna subviridis.

Æschna subviridis, De Selys, Rev. Odon. p. 129 (1850).

Æschna viridis, Rambur, Ins. Névr. p. 200 (1842).

Pará, Jan. 4.

Previously in the Museum collection from Pará and the Tapajos.

Agrionidae.

CÆNAGRIONINÆ.

PSEUDOSTIGMATINA.

Genus MECISTOGASTER, Rambur.

Mecistogaster linearis.

Agrion linearis, Fabr. Gen. Ins. p. 249 (1776).

Forest, Santarem, Lower Amazons, Feb. 27, 1896 (captured by Mr. F. O. Pickard Cambridge).

A very common South-American species.

NORMOSTIGMATINA.

Genus CÆNONEURA, Kirb.

Cænoneura sylvatica (?).

Neoneura sylvatica (Hagen, MS.), De Selys, Mém. Cour. (9) xxxviii. p. 204 (1886).

Below Gurupá (*F.*), Jan. 24, 1896.

A single specimen, not fully coloured.

The type of *C. sylvatica* was received from Rio Janeiro.

Genus MICRONYMPHA, Kirb.

Micronympha fluviatilis.

Isochnura fluviatilis, De Selys, Bull. Acad. Belg. (2) xli. p. 269 (1876).

Between Gurupá and Monte Alegre, Jan. 24 ; Macapá (*F.*), Feb. 25, 1896.

A common and widely distributed species in South America.

Genus LEPTAGRION, De Selys.

Leptagrion, spp.

Gurupá, Jan. 23 ; Breves, March 1, 1896.

Two species, probably new ; but I do not wish to describe Cænagrioninæ at present, as the series in the British Museum is very poor.

The following species were obtained of other families of Neuroptera than the Odonata :—

Ephemeridæ.

Genus CAMPSURUS, Eaton.

Campsurus quadridentatus.

Campsurus quadridentatus, Eaton, Trans. Ent. Soc. Lond. 1871, p. 53, pl. lii. fig. 13 (details).

Above Santarem (*F.*), Feb. 1, 1896.

Not previously in the collection of the Museum.

Campsurus Picteti, n. n.

Palingenia dorsalis, Pictet (nec Burm.), Hist. Nat. Ins. Névr., Ephem. p. 153, pl. xiii. fig. 5 (1845) ; Walker, List Neur. Ins. Brit. Mus. iii. p. 549. n. 5 (1853).

Athenopus dorsalis, Eaton, Trans. Ent. Soc. Lond. 1871, p. 59.

Campsurus dorsalis, Eaton, Trans. Linn. Soc. Lond., Zool. (2) iii. p. 41 (1883).

Eighty miles below Breves, Jan. 11 ; above Santarem, Feb. 1, 1896.

Taken on the 'Faraday' on the night of Feb. 1, 1896, in numbers round the electric lights hanging over the stern.

One of the specimens has a mass of eggs adhering to the abdomen.

I have thought it necessary to rename this species, which is well described and figured by Pictet; for *Palingenia dorsalis*, Burm., is described as having three setæ as long as the body, and the head, thorax, back of abdomen, and nervures black. It can hardly be even congeneric with Pictet's insect.

Termitidæ.

Genus TERMES, Linn.

Termes dirus.

Termes dirus, Burm. Handb. Ent. ii. p. 766. n. 8 (1839).

Obydos, Feb. 2, 1896.

Four winged specimens.

Osmylidæ.

Genus OSMYLUS, Latr.

Osmylus, sp. (?).

A green species, apparently congeneric with *O. (?) longicornis*, Walker, from Georgia, with which it agrees in its setaceous antennæ.

Macapá, Feb. 25, 1896.

One specimen.

EXPLANATION OF PLATES.

PLATE XII.

	Page
Fig. 1. <i>Micrathyria basalis</i>	610
Fig. 2. <i>Cyclophylla Calverti</i>	613
Fig. 3. <i>Uracis Siemensi</i>	605
Fig. 4. <i>Perithemis Austeni</i> , ♂	602
Fig. 5. Ditto, ♀	602

PLATE XIII.

Fig. 1. <i>Micrathyria venusta</i>	612
Fig. 2. <i>Micrathyria flavescens</i>	600
Fig. 3. <i>Micrathyria eximia</i>	609
Fig. 4. — <i>Cambridgei</i>	608
Fig. 5. — <i>tibialis</i> , ♂	610
Fig. 6. Ditto, ♀	610

LXIII.—*The Otter of Central America.*

By C. I. FORSYTH MAJOR.

DURING the preparation of a detailed paper on the skulls of the Otters, the publication of which has been accidentally delayed by my absence from Europe, the species occurring in Central America has proved to need a new name. It may be called *Lutra annectens*, sp. n.

The nearest affinities of *L. annectens*, of which I have examined two skulls from Mexico, two from Guatemala, and one from Panama, are not with *L. felina*, Mol., as supposed by Tomes, Coues, Alston, and Allen, but with the North-American *canadensis*, as von Frantzius has supposed, and the South-American middle-sized Otters, as shown by O. Thomas; these last, in my opinion, must have only one name, viz. *L. enhydris*, F. Cuv. (emend.). It must be stated at the outset that not all the characters assigned to *canadensis* as distinctive from *enhydris* are constant, and neither are those of the latter; there are specimens of *canadensis* which in the form of the skull and teeth approach *enhydris*, and *vice versa*.

L. annectens agrees with *canadensis* (1) in having a straight inferior mandibular margin (in one skull from Alaska, however, it is curved as in South-American Otters, whilst in one from Ilheos, Brazil, it is straight, as usual in *canadensis*); (2) as in *canadensis*, the premolars in *annectens* are slenderer, less massive than in *enhydris*. But they even go beyond the northern form in this respect, as the anterior ones are so small that when the jaws are closed they do not closely interlock or touch one another, though they overlap. P. 2 inf. is smaller as compared to p. 1 than even in *canadensis*, and there is a real diastema between p. 1 and p. 2 inf.

P. 1 sup. also is less massive in *annectens* than usual in *enhydris*, and presents more the triangular form of *canadensis*; but here, again, it must be stated that in a skull (♂) from Surinam and in two (♀) from Brazil this tooth is triangular, whilst other South-American skulls from Cayenne, Desterro, Maldonado, &c. present transitions between the shape of the tooth in the first-named three and the massive almost quadrate form in one skull from British Guiana and two from Rio Grande do Sul.

In the following cranial and dental characters *annectens* shows agreement with *enhydris*:—

1. The upper contour of the skull slopes downwards anteriorly (in its facial part), whilst it is straight in *canadensis*.

2. The bullæ osseæ are, alike in *annectens* and *enhydris*, less flattened than in *canadensis*.

3. M. 1 sup. is, as in *enhydria*, more extended transversely; in *canadensis* it has a more quadrate shape, and is, besides, as a rule, distinguished from both by a nick in its posterior border.

In the relative dimensions of the skull *annectens* presents intermediate characters:—Absolute basal length: *canadensis* 95·8 (♀)—103·4 millim.; *annectens* 97·8 . 106·2; *enhydria* 93—115*.

Greatest breadth (percentage dimensions) :

<i>canadensis</i>	69·1—78·1
<i>annectens</i>	75 . 75·1
<i>enhydria</i>	67·1—77

Cranial breadth, behind zygomatic arches and above meatus audit. (pc. dim.) :

<i>canadensis</i>	55·3—56·1
<i>annectens</i>	58·3 . 59·8
<i>enhydria</i>	55·1—61

Breadth between upper canines (pc. dim.) :

<i>canadensis</i>	24·3—27·2
<i>annectens</i>	26·1 . 28·2
<i>enhydria</i>	24·5—28

Palate length (pc. dim.) :

<i>canadensis</i>	46·6—50·5
<i>annectens</i>	45·9 . 46·5
<i>enhydria</i>	42·9—54·6

In the greatest posterior breadth—as in the form and position of premolars—the Central-American Otters present features of their own, since they show the maximum of posterior breadth of all the crania under consideration :

<i>annectens</i> ..	72·7 . 74·5
<i>canadensis</i>	63·7—69
<i>enhydria</i>	62·5—71

The Central-American Otters, therefore, whilst sharing some characters with *canadensis*, on the whole approach more to *enhydria*. Besides, some of their characters are intermediate between the North-American and the South-American Otters; so that, even apart from their habitat, they are in more than one sense intermediate between their

* It must be confessed that my material of *canadensis* is sadly insufficient; the ten skulls of *enhydria*, of which all the measurements could be taken, give much better averages than the five of *canadensis*.

northern and southern relatives. And, lastly, they present some features of their own. As an obvious conclusion, we must expect that at some future date it will be possible to show that *canadensis*, *annectens*, and *enhydria* are but subspecies of a single species.

Measurements of the skull of the type (σ) in millimetres:—

Basal length 106·2; greatest breadth 79·8; cranial breadth 63·5; breadth between upper canines 30; interorbital breadth 26; greatest posterior breadth 77·2; palate length 48·7.

Hab. Terro Tepic, Rio de Tepic, Jalisco, Mexico. Coll. Dr. A. C. Bullen, Jan. 1891.

Type Brit. Mus. no. 92. 3. 17. 8.

LXIV.—*On the Relations of Antennophorus Uhlmanni, Haller, to Lasius mixtus, Nyl.* By M. CHARLES JANET*.

ANTENNOPHORUS UHLMANNI is an Acarid which was described in 1877 by Haller from specimens found in Switzerland in a nest of *Lasius niger*. Since that time this species has been found by Karpeller in Hungary in a nest of *Lasius umbratus*. These two references are the only ones with which I am acquainted. No observations have been made up to the present on the habits of this creature.

I have found it in abundance in the garden of the Villa des Roses, near Beauvais, in a splendid nest of *Lasius mixtus*, and I took advantage of the opportunity to set up a nest for observation, which has enabled me to ascertain the relations of this parasite with its host.

Antennophorus Uhlmanni lives as an epizoon upon *Lasius*. It fixes itself on the lower surface of the head or on the sides of the abdomen of its host by means of the carunculae in which its feet terminate, and which are furnished with a very adhesive sticky substance.

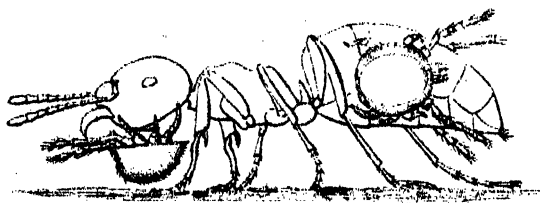
These parasites are blind, but the first pair of feet is transformed into long antenniform appendages provided with very sensitive olfactory organs. They do not wander about in the galleries of the nest, but walk over the bodies of the ants, passing from one to another. When an *Antennophorus*, detached from the body of an ant, lies upon the soil in one of the galleries of the nest, it raises and stretches forward its first pair of ambulatory feet, and at the same time explores the space around it with its long antenniform feet. These

* 'Comptes Rendus,' 1897, t. cxxiv. pp. 583-585.

appendages are much more agitated when an ant passes close by. If it pass near enough, the Acarid glues itself on to its body by means of the cap of sticky material on the end of one of its ambulatory feet, which it holds up ready for this operation; and it can in this way soon climb up and fix itself in a good position on its host. This latter is surprised and seeks to rid itself of the new comer, but, failing in this, it becomes resigned very quickly as soon as the Acarid has taken up one of its normal positions.

Generally a working ant only carries a single *Antennophorus*, but they may very often be seen carrying several. In all cases, the parasites take up positions symmetrical with the sagittal plane of their host's body, and it thus comes about that the centre of gravity of the extra load is placed in the sagittal plane of the carrying ant.

The Acarids are also under the best conditions for not hampering the movements of the ants, and, as a consequence, for being the more readily tolerated by them. The *Antennophorus* directs its antenniform feet towards the front of the ant if fixed upon its head, and in the reverse direction if fixed upon the abdomen. When an ant carries but one *Antennophorus*, it is almost always placed on the head of the host. The case (represented in the figure) of an ant carrying an



Lasius mixtus bearing three *Antennophorus Uhlmanni* in their normal positions. $\times 12$.

Antennophorus under its head and one on either side of the abdomen is very common. The presence of one or more of the parasites on the body of a *Lasius* does not prevent the latter from taking its share in the work of the colony and in particular the carriage of the larvæ and rubbish.

The *Antennophorus* attaches itself freely to the naked nymphs, but never to a nymph enveloped in a cocoon. Thus in an experimental nest consisting of some fifty ants, all carrying a single *Antennophorus* and accompanied by a certain number of nymphs, I found on the following day a newly emerged ant which bore seven *Antennophori* arranged

symmetrically as follows :—two (one on the top of the other) on either side of the head and on the abdomen, one on the middle of the dorsal region, and one on either side. It would appear that the *Antennophorus* is attracted to the young ants on account of the care with which they are looked after and fed by their older companions. These latter do not seek to drive away the parasites, which spread themselves a little later. At the moment when a queen throws off her nymphal envelope the workers come to her assistance, and as the workers carry the *Antennophori*, these latter generally take advantage of the position to pass over to the body of the newly emerged queen.

The *Antennophorus* itself feeds exclusively on the nutritive fluid disgorged by the ants. Fifty *Lasii* carrying *Antennophori* were placed in an observation nest and left without food. Eight days later the ants were in perfect condition, but ten or more *Antennophori* had already died of hunger. A tiny droplet of honey tinted with Prussian blue was allowed to run over the lower face of the glass plate which formed the roof of the nest. A large number of ants, nearly every one of which carried an *Antennophorus*, ranged themselves as closely as they could be packed all round the drop. The *Antennophori* had no share in the meal, and they were obliged to retire a little because there was no room for them between the heads of their hosts and the glass to which they were applied. The ants of this brood had acquired the habit of placing themselves, crowded one against the other, in one corner of the nest, and there they came with their crops well filled after the meal of blue honey, and there they disgorged it before the mouths of their comrades who had had none. Now the ant in the act of disgorging opens its mandibles wide. The peristaltic movements of the oesophagus and the movements of the pharynx brought up the globules of honey, the blue colour of which made them readily visible, and they formed a little drop in front of the mouth. While the fasting ant was eating the honey thus disgorged, the *Antennophorus* riding on its head took its share. To do this it pushed itself forward and thrust its rostrum into the droplet. Generally, while holding itself in position by means of the two hinder pairs of legs, it attached itself by means of the forward pair to the head of the disgorging ant. Very often when the fasting ant had ended its meal and was retiring one would see the *Antennophorus* try to keep its hold on the disgorging ant. The two *Lasii* generally lend themselves to this prolongation of the meal, and, if they are slightly separated from one another, the *Antennophorus* stretches itself to its full

length, and forms, back downwards, a sort of bridge between the heads of the two ants.

If the disgorging ant carries an *Antennophorus* beneath its head, this, too, takes its share in the meal. An *Antennophorus* placed on the abdomen of an ant can also obtain food without quitting its hold. In fact, when another ant comes near it, it seems to understand, by striking it with its antenniform feet and stretching towards it its first pair of ambulatory feet, to ask for and to obtain food.

In conclusion, the *Antennophorus* is a parasite which lives as an epizoon on *Lasius* and feeds upon the nutritive liquid disgorged by the ants. This recalls what I have already described for *Lepismima polypoda* ('Comptes Rendus,' t. cxii. p. 799; see this Journal, 1896, vol. xvii. p. 398); but here we have a case of myrmecophily far more advanced, since the *Antennophorus* feeds itself exclusively on the disgorged liquid, and, further, its presence is regarded as a matter of course by the ant, which gives, even willingly, the food it demands.

LXV.—*Diagnoses of new Land-Shells from Flores, Malay Archipelago.* By EDGAR A. SMITH.

THE species about to be described form part of a valuable collection of land-shells obtained by Mr. A. Everett in South Flores. The typical green form of *Xesta Everetti* is one of the most remarkable shells yet discovered in this or the neighbouring islands.

Xesta Everetti.

Testa turbinata, anguste umbilicata, saturate viridis, versus apicem purpurea, infra suturam albo marginata; spira conoidea; anfractus 7, convexiusculi, lineis incrementi tenuibus, obliquis, arcuatis striati, superiores minute spiraliter striati, ultimus haud descendens; apertura parum obliqua, intus caeruleo-alba; peristoma tenue, margine columellari ad insertionem dilatato albo reflexo.

Diam. maj. 53 millim., min. 43; alt. 50; apertura 30 longa, 27 lata.

Var. Testa viridis, anfr. ultimo et penultimo supra medium rufo obscure zonatis.

Diam. maj. 55 millim., min. 50; alt. 57.

Var. Testa olivaceo-fuscescens.

Diam. maj. 54, min. 48; alt. 50.

Hab. South Flores.

This is an extremely fine species and probably the largest of the genus yet discovered. The very deep green colour of

the typical form is most striking and unusual. The purplish apex and the white suture are common to all specimens. Some are thickened within and very heavy and solid in consequence, whilst others, on the contrary, are much thinner and lighter.

Xesta polymorpha.

Testa fere imperforata, obtuse turbinata, albo-lutescens, confertim nigro-punctata, apicem versus purpurascens, ad basim zona lata nigro-fusca ornata; spira lata, arcuata, obtusa; anfractus $6\frac{1}{2}$, parum convexiusculi, lente accrescentes, lineis incrementi obliquis tenuibus striati, ultimus haud descendens, infra indistincte concentrice striatus, circa medium pallidus; apertura obliqua, late lunata, intus plus minus purpureo-nigrescens; peristoma arcuatum, margine dextro tenui, columellari incrassato, ad insertionem reflexo, appresso.

Diam. maj. 33 millim., min. 30; alt. 27.

Var. a. Testa typo similis, sed basi pallide rufo-lutescente, sparsim dilute nigro-punctata.

Var. b. Testa flavescens, confertim subpellucide punctata, anfractibus quatuor superioribus roseo-purpureis, ultimo infra rufescenti-luteo, apertura intus pallida, peristomio rufescente.

Var. c. Testa pallide lutea, confertim pellucide punctata, anfr. ultimo infra purpureo-nigro late zonato.

Var. d. Testa albida, confertim pellucide punctata.

Hab. South Flores.

The form of this handsome species is fairly constant, but some specimens are rather more elevated than others. The colour, on the contrary, is very variable; in the type and vars. *a* and *b* the upper part of the spire is purplish, but in the vars. *c* and *d* it is pellucid whitish, and the suture in all the forms at this part of the shell is white-margined. In the type and var. *a* the last and penultimate whorls are stained with black below the suture and at the middle of the body-whorl. Although termed varieties for convenience' sake, it must not be inferred that any persistency of coloration is attributed to them, for there are no grounds for supposing that these shades of colouring are transmitted from one generation to another, more especially as all the forms occur together under the same conditions.

Xesta subpolita.

Testa perforata, breviter turbinata, pallide castanea, versus apicem viridi-cærulea vel viridescens, subpolita, lineis incrementi tenuibus obliquis striati, striis spiralibus tenuibus confertis supra spiram et basim anfr. ultimi sculpta; anfractus 6, convexiusculi, regulariter

lente accrescentes, sutura pallida sejuncti, ultimus antice subdescendens; apertura obliqua, late lunata, intus livido-fuscescens; peristoma intus fuscum, margine dextro tenui, columellari leviter crassiore, ad insertionem dilatato et reflexo.

Diam. maj. 39 millim., min. 33; alt. 30.

Exemplum alterum.—Diam. maj. 33, min. 29; alt. 30.

Var. Testa cinereo-viridis, ad suturam et circa medium anfr. ultimi dilute rufo zonata.

Var. Testa omnino flava.

Hab. South Flores.

Variable both in form and colour. It may be only a variety of *X. cochlostyloides* of Schepman, differing in its greater size, more glossy surface, and the want of the diaphanous periostracum.

Xesta melanaraphe.

Testa turbinata, perforata, albida, circa medium anfr. ultimi et ad suturam nigro cincta, supra medium anfr. ult. zona fusca nigro punctata, altera latiore infra ornata, strigis et maculis obliquis albis hic illic interdum variegata; spira conoidea, leviter convexa; anfractus 6, convexiusculi, lente accrescentes, lineis incrementi tenuibus obliquis, striisque spiralibus minutis indistinctis sculpti, ultimus subdescendens; apertura leviter obliqua, late lunata, intus albo et fusco zonata; perist. tenue, margine columellari ad insertionem breviter dilatato et reflexo.

Diam. maj. 25 millim., min. 23; alt. 23.

Hab. South Flores, low country.

This species, judging from the specimens examined, is more constant in its coloration than those previously described. Probably in very fresh examples the opaque white epidermal stripes which usually appear in the direction of the lines of growth and only upon the last whorl are more evident, for in ordinary specimens, being easily deciduous, they are generally worn off. The dark brown band below the middle of the body-whorl occupies nearly the entire base, leaving only a pale band between it and the peripheral black zone and a small central whitish space around the narrow umbilicus. The suture is bordered on both sides with black or brownish black.

Pupina Dohertyi.

Testa pupiformis, tenuis, nitens, pallide rufescens; spira elongata, ad apicem subobtusa; anfract. $5\frac{1}{2}$, convexiusculi, infra suturam pellucido marginati, ultimus supra aperturam leviter planatus, pone valde oblique descendens, ad aperturam vix ascendens; apertura circularis, intus pallide rufescens; perist. leviter incrassatum, albidum, antice subexpansum, margine sinistro incrassato, superne

626 *New Land-Shells from Flores, Malay Archipelago.*

in dente lamelliformi intrante terminante; scissura antica angusta, obliqua.

Longit. 8 millim., diam. $4\frac{1}{2}$; apertura $2\frac{1}{2}$ lata.

Hab. South Flores, at 4000 feet (Everett); Dongo Mountains, Sumbawa, at 2500–5000 feet (W. Doherty).

Registoma floresianum.

Testa ovata, obliqua, distorta, rufescens, polita; spira obliqua, ad apicem acutiuscula; anfractus 5, superiores tres vix convexiusculi, parvi, penult. major, sinistrorsum prominens, ultimus valde oblique descendens, supra aperturam subplanatus; perist. rufum, incrassatum, antice expansum; scissura columellaris minime profunda, fere obsoleta.

Longit. 7 millim., diam. $4\frac{1}{2}$; apertura $2\frac{1}{2}$ lata.

Hab. South Flores, 4000 feet.

This species is remarkable for its oblique growth, the short pointed apex, the red peristome, and very slight notch in the columellar margin. The suture has a narrow dark margination beneath it.

Diplommatina floresiana.

Testa sinistrorsa, ovata, supra acuminata, tenuis, corneo-rufescens, oblique tenuiter costellata; anfr. 6, perconvexi, primi duo læves, ultimus supra aperturam constrictus, penultimo minor; apertura subcircularis, longit. totius $\frac{1}{3}$ haud æquans; perist. duplex, leviter incrassatum, marginibus haud junctis, columellari intus obscure unidentato, inferne subauriculato.

Longit. $3\frac{1}{2}$ millim., diam. 2.

Hab. South Flores, 4000 feet.

In one specimen the riblets near the constriction of the body-whorl are much closer together than those upon the rest of the shell.

Diplommatina chrysostoma.

Testa dextrorsa, pupiformis, rufescens, plus minus pellucida et polita; anfr. 6, apicales 1–2 læves, convexi, duo sequentes convexi, confertim oblique striati, penult. lævis, inflatus, ultimus penultimo minor, aperturam versus tenuiter costellatus, supra aperturam planatus, ad sinistram obtuse varicosus, prope labrum ascendens; apertura magna, aurantiaca; peristoma parum incrassatum, extus subvaricosum, aliquanto patulum, marginibus callo tenui junctis, columellari latiore, intus vix dentato.

Longit. 6 millim., diam. 3; apertura 2 lata.

Var. Albida, pellucida.

Hab. South Flores, 4000 feet.

The swelling or varix upon the body-whorl above the columella is a prominent feature in this species, and the varix

behind the labrum is finely striated. The striæ on the third and fourth whorls are numerous and thread-like.

Arinia blanda.

Testa minima, dextrorsa, alba, subpellucida, tenuissime oblique striata, striis supra tergum anfr. ultimi magis distantibus; anfr. $5\frac{1}{2}$, perconvexi, penultimus ultimo latior, ultimus parvus, pone oblique descendens, ad labrum leviter ascendens, supra columollam varicoso tumidus et constrictus; apertura subcircularis, longit. totius $\frac{1}{4}$ adæquans; peristoma incrassatum, reflexum.

Longit. 2 millim., diam. 1.

Hab. South Flores, at 4000 feet.

The constriction upon the body-whorl above the aperture marks the termination of the very fine striæ, those upon the rest of the whorl being conspicuously further apart.

LXVI.—On a new African Pierine Butterfly of the Genus *Mylothris*. By ARTHUR G. BUTLER, Ph.D. &c.

THE following species was received among the Old-World Pierinæ of the Godman and Salvin collection:—

Mylothris primulina, sp. n.

Intermediate in character between *M. asphodelus* and *M. sulphurea* from the Cameroons.

♂. Above milk-white, the costa and the basal area of primaries to end of cell bright cowslip-yellow, changing at base and on the basal half of costa to bright cadmium-yellow; a smoky black apical patch, rather broader than in *M. sulphurea*, a large spot almost confluent with the latter at end of second median branch, and a dot at end of first median branch also black: secondaries bright cowslip-yellow at base, six small black marginal spots. Body above greenish grey; abdomen creamy white at the sides. Primaries below with the cadmium-yellow at the base more extended and the apical third of the wing traversed by greenish-yellow internervular streaks; apical patch only visible through the wing, but seven black marginal spots: secondaries with the yellow at base slightly more extended and the base of costa cadmium-yellow, the outer border faintly tinted with primrose-yellow, the black marginal spots rather larger than above. Body below creamy white, the pectus with a feeble tint of primrose.

Expanse of wings 58 millim.

Ondo country, Lagos (*Sir G. Carter*). From Godman and Salvin coll.

We have two males of this very pretty species.

LXVII.—*Some new Forms of American Rotifera.*—II.

By Dr. ALFRED C. STOKES.

[Plate XIV.]

THE following presumably undescribed Rotifera were all taken from a shallow clear-water pool in a rocky wood near Trenton, New Jersey, U.S.A.

Notommata vorax, sp. n. (Pl. XIV. figs. 1-3.)

Elongate, subcylindrical, exceedingly soft, flexible, and changeable; ventral surface flattened; integument often thrown into numerous irregularly longitudinal folds; front rounded, but exhibiting in side view a short curved proboscis similar to that of *Taphrocampa*, and visible in dorsal or in ventral aspect as a narrowly semicircular appendage; body somewhat tapering posteriorly; tail represented by a short inconspicuous semicircular projection; foot short, oblong, changeable; toes short, robust, conical, excentrically acuminate; cilia entirely prone; auricles conspicuous, subcylindrical, surrounded by a hyaline subspherical membrane bearing the long cilia; dorsal antenna a single minute setigerous fossa; lateral antennæ not observed; brain large, extending to or beyond the mastax, the posterior extremity opaque, a single red eye placed at the front of the granular mass; trophi forcipate, protrusible; œsophagus long, conspicuous, irregularly annulate, or sometimes apparently twisted and cord-like; gastric glands present, multinucleate; stomach and intestine not differentiated from each other; ovary ventrad to the intestine; contractile vesicle subspherical, near the posterior extremity; foot-glands two, but apparently accompanied by two or more smaller glands; movements vermicular, except when swimming by the aid of the auricles, when the motion is often rotary on the longitudinal axis; posterior body-region imperfectly retractile, the toes not being withdrawn entirely into the body.

Length about $\frac{1}{100}$ inch.

Habitat as mentioned at the head of this paper, as is that of all the following forms.

This seems to be a delicate creature, but its voracious appetite is amusing. I have noted several specimens with the intestinal canal distended by a long unbroken filament of alga (*Oscillatoria*) bent upon itself and in the process of digestion. In a single instance I have observed a similar

thread of *Oscillatoria* by the Rotiferon's deliberate forward movement thrust through the mastax, the cesophagus, and the rest of the alimentary canal, until it impinged upon the posterior intestinal wall, where the resisting pressure turned the alga upon itself, when the upper free end slipped into the stomach.

This Rotiferon is, in my opinion, not a *Notommata*, but I place it in that genus for present convenience; neither do I think that *Taphrocampa clavigera*, mihi*, is a member of that genus, in which I have placed it for the same reason. When our American Rotifera are monographed in the future, a new genus will probably be needed to receive both these forms, with *Taphrocampa clavigera* as the type. There are others in our American waters closely allied to these, and sufficiently distinct to merit specific rank, but agreeing neither with *Taphrocampa* nor with *Notommata* as at present diagnosed, yet resembling both in some features, as do the two forms here mentioned.

Proules hyalina, sp. n. (Pl. XIV. fig. 4.)

Irregularly obconical, entirely transparent; dorsum arched, the ventrum somewhat flattened, the pectoral region beneath the mastax forming a conspicuous rounded projection; corona obliquely transverse and prone; coronal cilia of two kinds, those of the pectoral region large, long, vigorous, and apparently limited to a single series, the others shorter, fine, and delicate; dorsal antenna single, with but few long stout setæ; lateral antennæ conspicuous, each with one or two long stout setæ and several smaller radiating hairs; foot long, stout, tapering to the two short acute conical toes; brain irregular, not large, apparently suspended by several anterior nervous prolongations, and by the large nerves to the antennæ; eye single, red; mastax large, surrounded anteriorly by a collection of small subspherical bodies, apparently forming a glandular mass; two or more small pyriform salivary glands attached posteriorly to the mastax near the origin of the long strongly ciliated cesophagus; gastric glands subspherical, at the frontal shoulder of the stomach, which, with the intestine, is lobulated, especially when empty; anal orifice in a conspicuous dorsal projection; ovary ventrad to the stomach and the intestine; contractile vesicle small, ventrad to the intestine; lateral canals and the flame-cells chiefly limited to the ventral region, only a single flame-cell having been observed elsewhere, this being above the mastax;

* Ann. & Mag. Nat. Hist., July 1896.

foot-glands large, elongate-ovate; muscle-bands slender, conspicuous, numerous.

Length about $\frac{1}{100}$ inch.

Movements rapid.

My artistic skill is not great enough to enable me to draw this creature so as to give any idea of its crystalline transparency and brilliancy. The figure, therefore, is little more than a diagram to present the Rotiferon's contour as accurately as possible, with some indication of the position and proportionate size of the internal organs. A professional artist of great skill would be needed to do more.

Diglena contorta, sp. n. (Pl. XIV. fig. 5.)

Body elongate-subcylindrical, gibbous posteriorly, the front usually neck-like, the entire animal capable of considerable elongation and narrowing, when the gibbous region becomes flattened; front rounded, usually convex, bearing a small hook-like proboscis, beneath which the frontal border is conspicuously emarginate; ventrum flattened; dorsum rounded, suddenly but evenly depressed posteriorly, thence continued as a subcylindrical prolongation, the termination of which overhangs and almost completely surrounds the short rounded foot which projects from it as a small subglobose papilla; toes two, small, short, conical, divergent; cilia fine, short, numerous, filling a narrow elongate-obovate field, entirely prone and about one third the length of the animal; auricles present, small, apparently represented when retracted by a flabelliform or irregularly oval and conspicuously ciliated region on each lateral border of the head, although it is difficult to determine positively whence the organs are protruded, as the Rotiferon's movements are then rapid and erratic; dorsal antennæ two; lateral antennæ two; eyes not observed; brain large, long, saccate, extending from the front for about one third the entire length of the body, a small cluster of dark granules near the tip; mastax large, elongate-ovate, beneath the brain and extending scarcely beyond its tip; trophi weak, apparently forcipate; gastric glands immediately behind the mastax; stomach and intestine ciliated, not differentiated from each other except by the presence within the stomach and immediately next to the walls of a crowded layer-like mass of dark-bordered granules, sometimes grouped into distinctly polygonal areas, and often so numerous that they obscure all the rest of the internal anatomy; intestine comparatively thin-walled and without the conspicuous granules of the stomach-walls; ovary poste-

riorly placed, ventrad to the stomach and intestine; foot-glands long; lateral canals and flame-cells numerous, but apparently without contractile vesicle; movements rapidly swimming by means of the auricles or writhing with indescribable contortions.

Length about $1\frac{1}{10}$ inch.

Mastigocerca spinigera, sp. n. (Pl. XIV. fig. 6.)

Lorica in lateral aspect hemispherical, somewhat depressed, ventrum flattened; frontal border somewhat excavate transversely, elastic and contractile; dorsum not crested, but anteriorly flattened, the lateral borders of the lorica being somewhat compressed and slightly concave, the dorsum thus showing on each side a slight posteriorly convergent ridge; foot single-jointed; toe exceeding the lorica in length, tapering to a finely acuminate termination; accessory basal stylets small, from four to six in number, voluntarily and separately movable; dorsal antenna prominent, located on the flattened region about one third the length of the lorica from the frontal border, the setæ few (apparently only two), stout and seemingly fleshy; each lateral antenna at the base and in front of a stout, slightly curved, acuminate thorn-like process; eye single, red, at the extremity of a saccate lobe of the large brain; occipital region of the front bearing a conspicuous subcylindrical proboscis-like organ, which is flexible and movable.

Length of the lorica, including foot, $2\frac{1}{10}$ inch; height (depth) of lorica $3\frac{1}{10}$ inch; length of toe $1\frac{1}{10}$ inch.

This form is remarkable for the apparently fleshy setæ of the dorsal antenna and for their fewness; but it is chiefly notable for the peculiar and characteristic thorn-like processes which accompany and perhaps form a part of the lateral setigerous antennæ. The short apically concave antennæ are so close to these thorns or so intimately connected with them that they cannot be optically separated.

The internal structure calls for no special mention.

Cathypna scutaria, sp. n. (Pl. XIV. fig. 7.)

Lorica broadly elliptical in outline, punctate; frontal borders excavate, the pectoral more deeply so than the dorsal; fronto-lateral apices subacute; posterior region much depressed and continued as a conspicuous, somewhat dorsally curved, shield-like projection dorsad to the foot and covering it, the posterior border concave, the postero-lateral terminations obtusely pointed; dorsal antenna single, apparently a small setigerous

pit; lateral antennæ small, on the ventral aspect of the lateral inangulation, and almost concealed within the sulcus; frontal and lateral borders of the head bearing a hyaline, flexible, collar-like membrane or hood, folded together and withdrawn into the lorica during the retraction of the animal; brain large, obscurely three-lobed posteriorly; eye single, red, subcentrally placed on the nerve-ganglion; gastric glands retort-shaped; stomach bearing internally an undulating membraniform appendage, which is in reality a tubular prolongation similar to that of *Floscularia*, *Apsilus*, and others; foot short, single-jointed, about as broad as long; toes rod-like, about as long as the greatest width of the lorica, each one-shouldered and with a minute seta on the shoulder; claws acuminate, about one sixth the length of the toe.

Total length, including toe, 0.015 inch; width of lorica and length of toes without foot 0.006 inch.

Cathypna glandulosa, sp. n. (Pl. XIV. figs. 8-10.)

Rotiferon large and robust; lorica finely punctate; frontal borders almost even, the pectoral somewhat excavate between the lateral pointed apices; prolonged posteriorly as a broad, rounded, evenly convex region; toes long, rod-like, irregularly constricted in front of the rectangular shoulder, each of which bears a minute seta; claws about one third the length of the toes, tapering to an acute point; brain large, not lobed posteriorly; eye single, red, placed on the lower surface of the nerve-ganglion, so that the light must pass to it from above through the entire thickness of the ganglionic mass; gastric glands long, retort-shaped; stomach bearing internally an undulating apparently membraniform appendage, in reality a long broad tube continuous with the œsophagus; stomach and intestine usually in constant movement; ovary small when not functionally active, placed ventrad to the intestine and on the left-hand side; contractile vesicle large, transversely placed in the median line near the posterior border, the lateral canals plainly connected with it on each side; flame-cells flabelliform; foot-glands six, geminate, the three groups varying greatly in size and form; lateral antennæ not observed; dorsal antenna single, apparently a circular depression furnished with long setæ and placed at the gap of a central obconical incision in the hyaline hood, which covers it during retraction.

Length of lorica $\frac{1}{8}$, width $\frac{1}{10}$ inch; length of toes $\frac{1}{16}$ inch.

The Rotiferon is remarkable for its large size and robust character, but chiefly for the apparently superabundance of

its foot-glands. These are six geminate multinucleate bodies, arranged according to size and form as shown by fig. 10. The two in the median line are the smallest and exhibit the most characteristic form, being elongate-obovate, with somewhat flattened internal faces and long narrow ducts. Those of the second group are larger, elongate-obpyriform, and have almost horizontal irregularly sinuous ducts; while the third pair are robust, elongate-subcylindrical, and often variously curved or lobed. The ducts of all seem to meet to form a single common conduit; but they are so soon lost within the mass of foot-muscles, that it has not been possible to decide this point positively with my specimens.

EXPLANATION OF PLATE XIV.

- Fig. 1. *Notommata vorax*.
 Fig. 2. Ditto. Auricle.
 Fig. 3. Ditto. Toes.
 Fig. 4. *Proales hyalina*.
 Fig. 5. *Diglena contorta*.
 Fig. 6. *Mastigocerca spinigera*.
 Fig. 7. *Cathypna scutaria*.
 Fig. 8. *Cathypna glandulosa*; dorsal.
 Fig. 9. Ditto; ventral.
 Fig. 10. Ditto. The geminate foot-glands.

LXVIII.—*Descriptions of Eleven new Species of Land and Freshwater Mollusca from South Africa.* By JAMES COSMO MELVILL, M.A., F.L.S., and JOHN HENRY PONSONBY, F.Z.S.

[Plate XVII.]

WE consider that several of the Mollusca now to be described possess a peculiar interest, notably the *Achatinæ*, one of which has remained long unrecognized, though collected years ago in Bechuanaland by Dr. Livingstone; whilst the other, a remarkably conspicuous though variable form, inhabits the Drakensberg range of mountains. The discovery of a *Hapalus* so far south in the African continent is likewise important, whilst new forms of the attractive genus *Ennea* still continue to come to the front, no one species exhibiting much, if any, variability*.

* See Ann. & Mag. Nat. Hist. ser. 6, vol. xviii. p. 314.

Ennea Cairnsi, sp. n. (Pl. XVII. fig. 1.)

E. testa curta, cylindriformi, parum rimata, albida, apice obtusissimo; anfractibus octo, superioribus angustis, paullum ventricosis, tribus ultimis rectis, undique longitudinaliter obliquistriatis; apertura rotunda: peristomate albo, incrassato, dentibus plicisve quinque munito, plica parietali permagna, crassa, valde intrante, dentibus labialibus duobus, quorum inferiore majore, dento basali parvo, plica columellari plus minusve superficiali, parum intrante, nec mammæformi.

Long. 8, lat. 4 mm.

Hab. Mouth of the Buffalo River, S. Africa (e coll. R. Cairns, Esq.).

A short, cylindrical, whitish species, of very neat appearance, extremely obtuse towards the apex, the whorls eight in number, narrow, the three lowest being straight. They are entirely longitudinally obliquely striate; the aperture is rounded; peristome white, thickened, furnished with five plaits or teeth—of these the parietal is the most conspicuous, being thickened and deeply penetrating; the labial teeth are two, the lower the larger; the basal tooth is similar to the upper labial, small and simple; the columellar plait does not, as in the majority of the South-African *Enneæ*, seem deep-seated or mamillar, but superficial and simply plaited.

We have pleasure in naming this interesting form after Mr. Robert Cairns, Ashton-under-Lyne, who communicated it to us for description. Three specimens.

Ennea Burnupi, sp. n. (Pl. XVII. fig. 2.)

E. testa cylindrica, anguste sed profunde rimata, apud apicem attenuata, obtusa, albida; anfractibus novem, apud suturas impressis, parum ventricosis, undique longitudinaliter obliquistriatis; apertura rotunda; peristomate incrassato, dentibus plicisve quinque munito, videlicet, plica parietali magna, acinaciformi, intrante, dentibus labialibus duobus, quorum inferiore majore, dente basali acuto, parvo, plica columellari interna, acuto-mamillata.

Long. 8, lat. 4 mm.

Hab. Town Bush, Maritzburg, and Gordon Falls, on the Zwaartkop Mountain, Natal.

A pretty form, which comes in the same category as *E. regularis* and *aperostoma*, described by us in former years from the same neighbourhood. The last-named species differs, however, *in toto* in shape, being not so attenuate apically, but more evenly cylindrical throughout, and *E. regularis* is more compressed at the sutures, only six-, as against

nine-whorled, and also differently shaped, the mouth-processes being nearly identical; the mammiform columellar plait is, however, in *E. Burnupi* thinner, and not bulbous as usual.

Mr. Burnup, the collector of this and of so many other new species in Natal, remarks that this is the only species of the genus which he has hitherto met with living "off the ground, it having been discovered on the under surface of the leaf of a *Dracena*."

Hapalus catarractæ, sp. n. (Pl. XVII. fig. 4)

H. testa ovato-fusiformi, translucida, pertenui, lævi, pallidissime corneo-olivacea; anfractibus quinque, apicali obtuso, ultimo rapide accrescente, paullum inflato, immaculato; apertura parva, ovata, labro exteriore tenui, simplici; columella rectiuscula, regionem apud umbilicarem triangulatim reflexa.

Long. 4.50, lat. 2.50 mm.

Hab. Howick (a waterfall near Pietermaritzburg), Natal.

Four specimens of a very small but neat *Hapalus*, a genus not before known so far south, Bulimoid in its superficial conchological characters, allied apparently to *Pachnodus*, but its exact affinities are not yet certainly known. In the British Museum it is arranged near *Opsas*.

The shell is ovate-fusiform, very pellucid, of the palest horny olive, five-whorled, the apical being obtuse and the last whorl rapidly increasing, a little inflated; mouth small, ovate, outer lip thin, simple; columella straight and triangularly reflexed over the umbilical region.

This constitutes a particularly interesting addition to the South-African molluscan fauna.

*Trachycystis teretiuscula**, sp. n. (Pl. XVII. fig. 5.)

T. testa depresso-globulosa, angusto sed profunde umbilicata, tonni, delicata, olivaceo-cornea; anfractibus sex, ventricosis, apud suturas impressis et quasi-canaliculatis, arcuissime longitudinaliter et indistincte striatulis; apertura lunata; peristomate tenui, simplici.

Long. 3, lat. 4 mm.

Hab. Howick, near Pietermaritzburg.

Though small and without any very special characteristics, we are quite unable to match this little *Trachycystis*. It is depressedly globular, narrowly but deeply umbilicate, thin, uniformly olive-horny in colour, six-whorled, the whorls being tumid and almost canaliculate at the sutures, so impressed

* *Teretiusculus*, small and smooth.

are they. The extremely delicate striæ are so indistinct as to be hardly discernible; but they give a silky appearance to the surface. The mouth is linear; peristome thin, simple.

Four specimens.

Achatina Livingstonei, sp. n. (Pl. XVII. fig. 6.)

A. testa angusta, fusiformi, tenui, straminea, lævi, apice obtuso; anfractibus septem, apud suturas paullum impressis, ventricosulis, ultimo cæteris longitudine superante, longitudinaliter flammis zebrinis castaneis decorata, flammis hic rectis, illic ramosis vel divaricatis; apertura ovata, labri margine exteriori tenui, columellari versus basin truncato.

Long. 41, lat. 20 mm.

Hab. Kuruman, Bechuanaland (*David Livingstone*: in coll. *E. L. Layard*).

Shell somewhat narrow, fusiform, thin, smooth, apex obtuse; whorls seven, somewhat ventricose, impressed at the sutures, straw-coloured, and ornamented with chestnut zebrine longitudinal markings; these are in some instances straight, in others branched and almost divaricate; the last whorl exceeds all the others collectively; the mouth is rather narrowly ovate, outer lip thin; columellar margin truncate towards the base.

Allied to *A. Pfeifferi*, Dunker, and *A. polychroa*, Morelet.

We are glad of the opportunity afforded us, through the kindness of Mr. Layard in lending this most interesting shell to describe, of associating with it the name of the illustrious pioneer of missionary enterprise in Tropical Africa, the late Dr. Livingstone, by whom it was discovered.

Achatina drakensbergensis, sp. n. (Pl. XVII. fig. 7.)

A. testa magna, fusiformi, delicata, nitida, apice obtuso; anfractibus octo, ad suturas impressis, ventricosulis, albidis; epidermide luteo-olivacea omnino contexta, apicalibus exceptis, interdum fere lævibus, flammis zebrinis brunneo-castaneis depictis, ultimo anfractu simili modo superne apud medium, sed a medio usque ad basin immaculato, interdum anfractibus minute granulatis, flammis zebrinis fere absentibus, hic illic vittis vel flammulis interruptis solum designatis, ultimo anfractu infra medium similiter immaculato; apertura oblonga intus cærulescente, labro extus tenui, margine columellari sinuoso, conspicue apud basin truncato.

Long. 3·25, lat. 1·75 unc.

Hab. Inhluzan, Drakensberg range, Natal.

A highly interesting form, two varieties of which are before us. The shell is fusiform, with ventricose whorls, somewhat

impressed at the sutures; the ground-colour is white, but, with the exception of the apical whorls, a yellowish-olive epidermis more or less shining entirely covers the shell; this is ornamented with longitudinal zebra-like flames, more or less pronounced. In one specimen they are regular and entirely cover the surface till the middle of the last whorl, below which it is smooth, shining, and spotless. This variety is much smoother than the other, which is more or less covered with the minute cross granulations so common in members of this genus, while the zebra-like markings are almost obsolete. The mouth is oblong, within bluish, outer lip thin, rounded; columellar margin sinuous, markedly truncate towards the base.

Buliminus (Pachnodus) carinifer, sp. n. (Pl. XVII. fig. 8.)

B. testa obtecte umbilicata, conico-pyramidata, perfragili, nitente, undique minute decussata; anfractibus septem, quinque supernis attenuatis, ventricosulis, ad suturas impressis, duobus ultimis expansis, ultimo apud peripheriam acuticarinato, carina ipsa nitida, rufo-brunnea; apertura trapezoide, labro exteriori per-tenui, uniangulata, simplici; columella pallida, regionem apud umbilicarem valde reflexo.

Long. 18, lat. 12 mm.

Hab. Gordon Falls.

This handsome but very delicate *Buliminus* seems to us quite distinct from the allied *B. natalensis*, Krauss. It is as conspicuous a shell, of a bright warm brown colour, pyramidal in shape, seven-whorled; of these the upper five are attenuate and small, the last two expanding; at the periphery is a particularly acute keel, shining and of a red-brown colour. The whole shell, except the apical whorls, is covered with a minutely decussate sculpture. Mouth trapezoid, outer lip thin, angular; columella whitish, reflexed over the umbilicus, which is narrow but deep.

Subulina tugelensis, sp. n. (Pl. XVII. fig. 9.)

S. testa attenuata, fusiformi, pellucida, delicatula, pertenui, albolactea; anfractibus septem, quorum apicali obtusissimo, papillato, cæteris ventricosulis, levibus, ultimo producto; apertura oblonga; peristomate tenui, simplici; columellari margine recto.

Long. 14, lat. 4 mm.

Hab. Lower Tugela River, Natal.

An interesting form, more glossy than most of the hitherto recognized South-African species, of a beautiful translucent milky-white colour; whorls seven, the apical being very

obtuse, the rest slightly ventricose, all very smooth and shining; the last whorl is straightly produced; outer lip thin, simple; columellar margin straight.

Pupa (Faula) pereximia *, sp. n. (Pl. XVII. fig. 3.)

P. testa sinistrorsa, pyramidata, subrimata, apud apicem multum attenuata; anfractibus novem, quorum duobus apicalibus tumidis, cæteris apud suturas canaliculatis, quasi lateroulatis, omnino longitudinaliter rude liris, liris arcuatis, incurvis, ultimo anfractu curtato; apertura rhomboidea; peristomate albo, rugifero, incrassato, novem plicis vel dentibus instructo, duabus plicis parietalibus, similibus, valde intrantibus, duobus dentibus labialibus, quorum inferiore plicato, majore, duabus plicis basalibus, perlongis, intrantibus, duabus plicis columellaribus et, juxta basin, uno dente parvo.

Long. 7, lat. 4 mm.

A highly ornate little *Faula*, near *F. Glanvilleana*, Ancy, but of considerably larger size. The specimens before us are unfortunately not in very good condition, but happily the mouth-processes in one are quite perfect. The shell is turbinate or pyramidal, subrimate, sinistral, much attenuate towards the apex, nine-whorled (inclusive of the two tumid apical); the whorls are canaliculate at the sutures and have the appearance of tiling, each superimpending the other; they are rudely lirate, the liræ close, incurved; the last whorl is short; aperture rhomboid; outer lip white, wrinkled, with nine plaits or teeth—of these the parietal plicæ (2) and the basal (2) are long, thin, and deep-soated, and very similar, as are the two columellar plaits, the labial teeth (two), and one small columellar; one of the labial comes very near being a plait.

Planorbis (Segmentina) planodiscus, sp. n.

(Pl. XVII. fig. 10.)

P. testa placentali, depressiuscula, declinata, nitida, olivacea, pellucida, tenui, apice depresso; anfractibus quinque, ad suturas canaliculatis, ventricosulis, ultimo rapide accrescente, disco superiore subrotundato, inferiore planato, profunde excavato, segmentis ad basin perspicuis, peripheria obtusangula; apertura oblique obtuso-triangulari; peristomate simplici.

Alt. 1, diam. 5 mill. (sp. majoris).

Hab. Umgeni Valley, Natal.

An olivaceous shining *Segmentina*; depressed, thin, five-

* *Pereximius*, extremely beautiful.

whorled, canaliculate at the sutures, the upper disk rounded, the lower planate, deeply excavate; the lamellar segments clearly perceived radiating round the umbilicus; the shell is obtuse-angled at the periphery; the mouth is obliquely obtuse-triangular, lip simple.

Four specimens.

We have taken the largest specimen as the type.

Assiminea tyttha *, sp. n. (Pl. XVII. fig. 11.)

A. testa minuta, cornea, fere lævi, globoso-conica, solidiuscula; anfractibus quatuor, apicali obtuso, cæteris ventricosus, longitudinaliter indistincte striatulis, ultimo rapide accrescente, cæteris conjunctim magnitudine superante; apertura subrotunda; peristomate rotundo, simplici; columella obliqua, crassiuscula; operculo rubro, littoriniformi, normali.

Long. 1·50, lat. 1 mm.

Hab. Howick, near Pietermaritzburg, "on the under surface of the leaves of a sage-like shrub" (*Mr. Burnup*).

A few specimens of a very small *Assiminea*, bearing some likeness to *A. litorina*, Delle Chiaje, a native of British and South-European shores. The shell is bright horny, almost smooth, being indistinctly longitudinally striate, rather solid, four-whorled, the apical whorl obtuse, the rest tumid, the last whorl much larger than all the rest together; mouth almost round, outer lip round, simple; columella oblique, thickened; operculum normal.

* τυτθός, small.

EXPLANATION OF PLATE XVII.

- Fig. 1. *Ennea Cuirnsi*.
- Fig. 2. ——— *Burnupi*.
- Fig. 3. *Pupa (Faula) pereximia*.
- Fig. 4. *Hapalus catarractæ*.
- Fig. 5. *Trachycystis teretiuscula*.
- Fig. 6. *Achatina Livingstonei*.
- Fig. 7. ——— *drakensbergensis*.
- Fig. 8. *Bulinus (Pachnodus) carinifer*.
- Fig. 9. *Subulina tugelensis*.
- Fig. 10. *Planorbis (Segmentina) planodiscus*.
- Fig. 11. *Assiminea tyttha*.

LXIX.—On *Lepidoptera Heterocera* from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c.
—Part II. *Family* Geometridæ; *Subfamilies* Enochrominæ, Orthostixinæ, Larentiinæ, Acidaliinæ, and Geometrinæ.

[Continued from p. 573.]

Genus CIDARIA.

(Treit. ; Hampson, Fauna Brit. Ind., Moths, iii. p. 349 (1895).)

Cidaria luctuosaria.

Melanippe luctuosaria, Oberth. Etud. d'Entom. v. p. 53, pl. iv. fig. 13 (1880).

Cidaria luctuosaria, Græser, Berl. ent. Zeit. 1888, p. 410.

There was a fine series from Oiwake in Pryer's collection. Oberthür described this species from the Isle of Askold, and Græser records it from Amurland.

Distribution. Askold; Amur; Japan.

Cidaria cineraria.

Cidaria cineraria, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 451 (1878); Ill. Typ. Lep. Het. iii. p. 58, pl. lv. fig. 8 (1879).

There were some specimens from Oiwake and Yesso in Pryer's collection, and I have received others taken by a native collector at Hakodate: June and July.

This is probably a local form of *C. unangulata*, Haw.

Hab. Japan and Yesso.

— *Cidaria picata*.

Geometra picata, Hübn. Geom. fig. 134.

Cidaria picata, Treit. Schmott. vi. 2, 193; Guen. Phal. ii. p. 461.

Hydriomena picata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 72.

Occurs at Chang-yang, Ta-chien-lu, Chia-ting-fu, Che-tou, and Omei-shan in June and July.

The specimens show variation in the width of the lines forming the central band and also in the width of the white border of the band; in a large proportion of them the secondaries are devoid of marking on the upper surface.

The examples from Central China are rather smaller than the majority of those from the west, and appear to be more constant in always having the band composed of broad and often confluent lines.

Distribution. Europe; Ural; Central and Western China.

—*Cidaria variegata*.

Larentia variegata, Moorp, Proc. Zool. Soc. Lond. 1867, p. 653.

Cidaria variegata, Hampson, Fauna Brit. Ind., Moths, iii. p. 353 (1895).

One female specimen from Chia-kou-ho, taken in July.

Distribution. Sikhim (*Hampson*); Kashmir; Kulu; Western China.

Cidaria corylata.

Geometra corylata, Thunb. Ins. Suec. iv. p. 61, pl. iv. fig. 11 (1792).

Hydriomena corylata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 73.

Cidaria fabrefactaria, Oberth. Etud. d'Entom. v. p. 56, pl. iv. fig. 15 (1880).

There were specimens from Oiwake, Yesso, Nikko, and Ohoyama in Pryer's collection. Græsser records the species from Amurland, and Oberthür, under the name *fabrefactaria*, from the Isle of Askold.

Distribution. Europe; Ural; Amur; Japan; Askold.

—*Cidaria aurata*.

Cidaria aurata, Moore, Proc. Zool. Soc. Lond. 1867, p. 664; Hampson, Fauna Brit. Ind., Moths, iii. p. 355 (1895).

Cidaria corylata, var. *tsermosaria*, Oberth. Etud. d'Entom. xviii. p. 30, pl. iii. fig. 43 (1893).

One specimen in Pryer's collection.

Hampson considers *Cidaria corylata*, var. *tsermosaria*, Oberth., from Moupin, to be synonymous with *C. aurata*, Moore, which occurs throughout the Himalayas.

Distribution. Murree; Dharmasála; Sikhim; Bhután; Tibet; Khásis (*Hampson*); Kulu; Japan.

—*Cidaria fulgidaria*, sp. n.

Male.—Primaries yellowish; basal patch dark brown, its external edge angulated and bounded by a silvery-white line; central fascia broad on costa, much narrower on inner margin, both edges are bounded by wavy silvery-white lines, the external one deeply indented below the costa, and the internal one indented at the middle; the brownish outer marginal area is traversed by a serrated silvery-white line, and interrupted by an oblique streak of the ground-colour at apex, there is a smaller spot of the ground-colour on the middle of the outer margin. Secondaries greyish, basal and outer marginal areas darker, the former is limited by a wavy dusky line, and the latter is inwardly bordered by a pale macular band; discal spot blackish. Fringes of primaries

brown marked with yellow, those of secondaries are yellow marked with brown. Under surface: primaries yellowish, with the markings of upper surface faintly reproduced; secondaries yellowish dusted with brown and silvery-white scales, and traversed by wavy silvery-white edged brown bands; submarginal line macular, silvery white; fringes yellowish, chequered with brown.

Female.—Primaries as in the male, but the secondaries are white and without marking; fringes of these wings not marked with brown.

Expanse 32 millim.

Three male specimens and one female from Pu-tsu-fong, June.

Hab. Western China.

Allied to *C. corylata*, Thunb.

Cidaria albipunctaria, sp. n.

Primaries ochreous brown; basal patch and central fascia blackish brown, both are narrowly edged with white, the former is deeply indented in the middle of its outer edge, the latter has a double-toothed projection on its outer edge and is contracted below the costa and again above inner margin; on the outer marginal area there is a blackish-brown patch below the apex interrupted by a white blotch; submarginal line white and wavy, followed on the costa by a white blotch extending to the apex, and at outer angle by some white spots; the costal portion of the white outer edging of central fascia is diffuse, and the costal portion of the fascia contains a pale brown blotch, which is preceded and followed by a short white line. Secondaries whitish, greyish on outer margin, with faint indications of greyish central spot and two transverse lines. Fringes yellowish. Under surface: basal two thirds of primaries dusky, the outer edge corresponding with that of central fascia above, and intersected by two pale subbasal lines, the spaces between these lines being rather brownish; outer third is whitish, with a dark greyish patch on outer margin below apex, preceded by a brownish transverse cloud; secondaries whitish, powdered with brownish, and traversed by two brown lines, the discal spot is dark brown.

Expanse 34 millim.

Two male specimens, one from Ta-chien-lu, and the other from Pu-tsu-fong: June.

Hab. Western China.

This species is very closely allied to *C. corylata*, Thunb.,

but it is a much brighter-looking insect, and is further distinguished by the conspicuous white blotch on outer margin, together with the different contour of the central fascia.

Cidaria chimakaleparia.

Larentia chimakaleparia, Oberth. Etud. d'Entom. xviii. p. 37, pl. iii. fig. 33 (1893).

One specimen from Pu-tsu-fong, taken in June. Oberthür's type was from Ta-chien-lu.

Hab. Western China.

—*Cidaria ochracearia*, sp. n.

Closely allied to *C. fulvata*, Forst., but at once distinguished by its ochraceous secondaries, which have the fringes chequered with brown. The colour of the primaries is also deeper, and the edges of the central fascia, although angled outwardly and indented inwardly as in *C. fulvata*, are not waved. The under surface is entirely ochraceous, with slightly darker central markings on all the wings.

Expanse 26–29 millim.

Several specimens from Ta-chien-lu, Moupin, and Omei-shan: June and July.

Hab. Western China.

Fulvata, Forst., is placed by Meyrick in *Hydriomena*, Hübn. (Trans. Ent. Soc. 1892, p. 72).

Cidaria albicillata.

Phal. Geometra albicillata, Linn. Syst. Nat. x. 527; Clerck, Icon. i. pl. i. fig. 12.

Melanthia albicillata, Dup. Léop. viii. pl. clxxxviii. fig. 4; Guen. Phal. ii. p. 382.

Hydriomena albicillata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 73.

Melanthia casta, Butl. Ill. Typ. Lep. Het. iii. pl. liv. fig. 8.

There were specimens from Oiwake and Yesso in Pryer's collection, and my native collector captured the species at Hakodate in July.

Distribution. Europe; Altai; Amur; Japan; Yesso.

Except that they are generally rather larger, there is no important difference between Japanese examples (*casta*, Butl.) and European specimens of this species. The discal spots are a trifle larger, and the marginal border of secondaries is uninterrupted.

Cidaria yokohamæ.

Melanthia yokohamæ, Butl. Trans. Ent. Soc. Lond. 1881, p. 422.

Cidaria rogenhoferi, Græer, Berl. ent. Zeit. 1888, p. 419.

There was a specimen from Yokohama in Pryer's col-

lection, and I took one example at Gensan in July. Butler's type was from Yokohama and Græser records it from Raddefka.

Distribution. Japan; Corea; Amur.

Butler states that this insect is closely allied to "*M.*" *ruficillata*, but it appears to be nearer to *C. cuculata*, Hufn., and may possibly be an Eastern Asian form of that species.

— *Cidaria obscura*.

Cidaria obscura, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 450 (1878); Ill. Typ. Lep. Het. iii. p. 57, pl. lv. fig. 5 (1879).

There was one example in poor condition in Pryer's collection. I received a specimen from Mr. Manley taken at Yokohama, and my collectors in Western China took one at Moupin in July.

Distribution. Japan; Western China.

As Moore described a *Cidaria obscurata* in 1867, it would be better perhaps to rename this species *Butleri*.

— *Cidaria latifasciaria*, sp. n.

Primaries dingy purplish grey; small basal patch and broad central fascia brown, the former is outwardly limited by two blackish lines enclosing a brown band, and the latter has both edges darker than the median portion, and is limited on each side by a wavy blackish line, the outer one broadest towards costa, and the inner one broadest about the middle; there is a short blackish apical streak. Secondaries fuscous grey, darker towards outer margin. Fringes dark grey. Under surface fuscous brown; the secondaries have traces of a darker transverse line beyond the middle.

Expanse 42 millim.

One female specimen from Wa-shan, May.

Hab. Western China.

— *Cidaria procellata*.

Phalæna procellata, Fabr. Mant. Ins. 185.

Geometra procellata, Hübner. Geom. fig. 251.

Melanippe procellata, Dup. Léop. viii. pl. clxxxviii. fig. 3; Guen. Phal. ii. p. 303.

Hydriomena procellata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 73.

Melanippe inquinata, Butl. Ill. Typ. Lep. Het. iii. pl. liv. fig. 9.

There was a nice series from Oiwake in Pryer's collection.

I captured specimens in Satsuma in May, at Gensan in June, and at Tsuruga in August. Other Japanese localities are Yokohama (*Jonas*) and Hakodate (*Whitely*). I have

received the species from Kiukiang, and from several localities in Western China.

Distribution. Europe; Altai; Amur; Corea; Japan; Yesso; Central and Western China.

In my series of this species from China, Japan, and Corea there are specimens which exactly agree with typical *procellata*; others are identical with *inquinata*, Butl.; and others, again, are almost unicolorous fuliginous brown. All these forms are connected by intergrades.

Cidaria postalbaria, sp. n.

Primaries fuscous brown; basal patch and central fascia darker, the latter intersected by a pale line; the basal patch is outwardly and the fascia inwardly bordered by a pale line; outer margin suffused with dusky; submarginal line indicated by a white spot about the middle, one towards apex and a pale mark at outer angle. Secondaries white, suffused with smoky on the abdominal area, and with some black clouding about anal angle. Under surface fuscous grey on primaries, whiter on secondaries; there is a pale band beyond the middle on all the wings, this is clearly defined on its inner edge by a blackish line, which is elbowed about the middle of its length on primaries, and is crenulate on secondaries, the outer edge is diffuse; submarginal line of primaries represented by whitish dots, the largest about the middle. Fringes: of primaries agree with the ground-colour; of secondaries greyish marked with smoky grey.

Expanse 34-40 millim.

Several specimens, including both sexes, from Pu-tsu-fong, Omei-shan, Chia-kou-ho, and one female from Chang-yang: July.

Hab. Central and Western China.

Cidaria silaceata.

Geometra silaceata, Hübn. Geom. fig. 477.

Hydriomena silaceata, Meyrick, Traus. Ent. Soc. Lond. 1892, p. 73.

Cidaria umbrosaria, Motsch. Etud. d'Entom. 1864, p. 36.

There were some specimens from Yokohama in Pryer's collection, and my native collector obtained the species in the island of Kiushiu.

Several examples, including both sexes, were received from Chang-yang; these were taken in July, and range from 26-34 millim in expanse. The species also occurred at Ta-chien-lu, Omei-shan, Chia-ting-fu, Chia-kou-ho, Pu-tsu-fong, and How-kow in July; the largest of these specimens

measures 38 millim., and the smallest 30 millim. in expanse. The How-kow examples are of the typical form as regards the primaries, but the secondaries are almost devoid of marking.

Var. *angustaria*, nov.

All the wings are narrower than in the type, and heavily suffused with fuliginous on both surfaces; the white transverse lines of primaries are very clearly defined.

One example of each sex from Pu-tsu-fong.

Distribution. Europe; Amur; Japan; Kiushiu; Central and Western China.

Cidaria capitata.

Larentia capitata, Herr.-Sch. Deutsch. Ins. 105, pl. iii.

Hydrionena capitata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 73.

Cidaria Marietti, Butl. Trans. Ent. Soc. Lond. 1881, p. 424.

Cidaria Pryeri, Butl. l. c. p. 425.

Several examples from Yokohama and Oiwake in Pryer's collection. I took the species at Hakodate in August. Butler gives Nikko and Tokio also as localities.

Distribution. Europe; Amur; Japan; Yesso.

—*Cidaria fervidaria*, sp. n.

Male.—Primaries brown; basal patch and central fascia darker, both edged with ochreous, especially on the costal area; the fascia is deeply indented about the middle of its inner edge and elbowed on its outer edge; the reddish-brown median nervules, where they cross the fascia, are powdered with ochreous; submarginal line pale brown, intersecting some dark brown marks in the nervular interspaces; there is an oblique ochreous streak from apex. Secondaries orange-brown; basal and outer marginal areas clouded with darker. Fringes brownish on primaries; orange-yellow chequered with brownish on secondaries. Under surface fuscous brown, with a broad orange-yellow fascia beyond the middle, between this and the outer margin there is a short oblique series of orange-yellow dots, terminating in a patch of the same colour on the middle of the margin; secondaries orange-yellow, thickly sprinkled with brown, and traversed by darker central and submarginal bands.

Female.—Differs from the male in the paler colour of secondaries and the more distinct transverse markings on those wings; under surface orange-yellow, with conspicuous interrupted basal central and submarginal brown bands.

Expanse 32–36 millim.

One male specimen from Moupin and one from Omei-shan, one example of each sex from Chang-yang; these last are smaller than the other specimens.

Hab. Central and Western China.

— *Cidaria subochraria*, sp. n.

Primaries grey-brown, basal area clouded with darker; margins of central fascia dark brown, the inner edge of fascia indented, the outer elbowed; there are some dark clouds on outer marginal area, and the submarginal line, commencing as a pale dash from costa, is continued to inner margin as a series of dark internervular spots; there is also a short whitish dash from the apex. Secondaries ochreous brown, smoky on basal half. Fringes agree with the wings, preceded on the secondaries by a dark line. Under surface of primaries dark smoky grey, suffused on the costa with ochreous, and more strongly on the apical portion of outer marginal area, the latter being limited by a blackish band: secondaries are ochreous, powdered with smoky grey, and have a black discal dot and a blackish central band.

Expanse 36-38 millim.

Eight male specimens from Omei-shan, June.

Hab. Western China.

The central fascia is sometimes contracted below the middle, and in some specimens only the costal half is clearly defined. In some examples the secondaries are entirely smoky brown, with an ochreous tinge on outer marginal area.

Allied to *Cidaria* (*Eustroma*) *monana*, Swinh.

— *Cidaria oblongata*.

Cidaria oblongata, Walk. Cat. Lep. Het. xxv. p. 1402 (1862).

Cidariu decurrens, Moore, Lep. Atk. p. 270.

Specimens from Yokohama in Pryer's collection.

I took the species in Satsuma in May and at Tsuruga in June. My native collector took it in the island of Kiushiu, and I have received specimens from Ichang and the province of Kwei-chow.

Distribution. Khásis; Nynee-Tal (*Hampson*); Japan; Central and Western China.

— *Cidaria mactata*.

Cidaria mactata, Feld. Reise Nov. pl. cxxxii. fig. 38 (1875).

Specimens in Pryer's collection from Ohoyama and Nikko. I took the species in Hakodate, and have received it from

Kiushiu, Gensan, Kinkiang, Moupin, and Wa-shan. It occurs in June and July.

Distribution. Amur; Japan; Yesso; Kiushiu; Corea; Central and Western China.

— *Cidaria literataria*, sp. n.

Primaries pale greyish brown; subbasal band and central fascia chocolate-brown, the former contracted towards costa, the latter attenuated towards inner margin and containing an irregular patch of the ground-colour in the costal portion, below this the fascia is intersected by the pale median nervure; there are some chocolate-brown spots on costa, at the base of the wing, between fascia and subbasal band, and on apical area; the latter comprises a connected series of three and an apical dash; all the brown markings are outlined in whitish brown. Secondaries greyish white, with blackish discal dot. Under surface pale fuscous; secondaries and apical area of primaries irrorated with darker.

Expanse 38 millim.

One male specimen from Pu-tsu-fong, July.

Hab. Western China.

The markings of this species somewhat resemble those of *Eustroma cervinaria*, Moore.

— *Ciduria metaria*.

Ciduria metaria, Oberth. Etud. d'Entom. xviii. p. 39, pl. iv. fig. 54 (1893).

Oberthür's type was from Tâ-Tsien-Loû. My collectors did not meet with the species.

Hab. Western China.

— *Cidaria azonaria*.

Somatina azonaria, Oberth. Etud. d'Entom. xviii. p. 32, pl. iv. fig. 50 (1893).

This species occurred in most of the localities in Western China that my collectors visited: June and July.

Hab. Western China.

— *Cidaria nipponica*.

Eubolia nipponica, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 452 (1878); Ill. Typ. Lep. Het. iii. p. 59, pl. lv. fig. 11 (1879).

Cidaria nipponica, Hampson, Fauna Brit. Ind., Moths, iii. p. 357 (1895).

Cidaria suavata, Christ. Bull. Mosc. 1880, p. 69.

Hydrotomena nipponica, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 73.

Cidaria (*nipponica*, Butl., var. ?) *ignorata*, Staud. Iris, viii. p. 386 (1896).

There were specimens from Oiwake in Pryer's collection. I obtained the species at Gensan in July.

Staudinger records var. *ignorata* from North-east Thibet. Captain Young took specimens in Kulu, North-west Himalayas.

Distribution. Simla; Dharmasála; Sikhim (*Hampson*); Kulu; Japan; N.E. Thibet.

Cidaria polygrammata.

Geometra polygrammata, Bork. Eur. Schmelt. v. 567; Hübn. Geom. fig. 277.

Phibalapteryx polygrammata, Steph. Ill. Brit. Ent., Haust. iii. p. 256; Guen. Phal. ii. p. 436.

Hydriomena polygrammata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 73.

One specimen taken by myself in July at Nagahama.

Distribution. Europe; Amur; Japan.

Cidaria fumataria, sp. n.

Male.—Primaries brownish grey; basal patch and central fascia blackish, the inner edge of the latter is nearly straight and the outer edge has an obtuse projection above the middle, the median area of this fascia is pale and encloses a black discal spot; submarginal line whitish, shaded inwardly, especially towards costa, with dusky. Secondaries smoky grey, with a small black discal spot and faint indications of a pale central band. Fringes concolorous with the wings. Under surface smoky grey, basal two thirds of all the wings rather darker.

Female similar to the male, but the ground-colour is darker grey and the whitish submarginal line is clearer.

Expanse 22–24 millim.

Six male specimens and two females from Chang-yang, July and August.

Hab. Central China.

This species resembles *Plemyria galiata*, Hübn., in style of marking, but the ground-colour is very different.

Cidaria bipartaria, sp. n.

Primaries have the basal third olivaceous green, limited by an outwardly oblique black line; the rest of the wing is blackish with a grey tint; there is a greenish spot on costa, and, preceding it, two blackish lines, the outer one undulated and waved, edged internally with whitish. Secondaries dark

fuscous grey. Under surface fuscous, slightly paler on outer marginal area of all the wings.

Expanse 24 millim.

One female specimen from Pu-tsu-fong, June.

Hab. Western China.

— *Cidaria fasciaria*, sp. n.

Male.—Primaries dark grey, with two white bands, the first has an angular projection in its outer edge below costa and a small black cloud on inner margin; the second is biangulate, and transversely intersected by a dusky line; the central and outer marginal areas traversed by wavy white lines, and there is a white cloud-like spot at apex and a similar one about the middle. Secondaries fuliginous grey, with a paler central band; all the wings have a black discal spot. Fringes grey, marked with darker. Under surface of primaries fuliginous, traversed by two blackish lines and a pale band; there is a white spot on middle of outer margin: secondaries powdered with greyish on basal area and on outer margin, and traversed by a greyish curved band.

Female similar to the male, but the colour is greyish brown tinged with olivaceous at base and on middle of costa.

Expanse, ♂ 23, ♀ 25 millim.

Two male specimens and one female from Omei-shan, a female from Moupin, two from Ichang, and one from Changyang: June and July.

Hab. Central and Western China.

Cidaria parvaria.

Boarmia parvaria, Leech, Entom., Suppl. p. 52 (May 1891).

Two male specimens, probably from Yokohama, in Pryer's collection.

Hab. Japan.

Cidaria undulata.

Melanippe (?) *undulata*, Leech, Trans. Ent. Soc. Lond. 1889, p. 147, pl. ix. fig. 15.

One example of each sex from Kiukiang and a female specimen from Ichang, June and July. There is a specimen labelled "Chekiang" in the National Collection at South Kensington.

Hab. Central China.

Cidaria complicata.

Cidaria complicata, Butl. Ill. Typ. Lep. Het. iii. p. 57, pl. lv. fig. 4 (1879).

Two specimens taken by native collector at Gensan.

Butler's type was from Yokohama.

Hab. Japan and Corea.

Cidaria erectaria, sp. n.

Whitish, suffused with grey. Primaries have a brownish basal patch and central fascia, the first is limited by a slightly curved white line, the second is outwardly angled, edged with white, and is preceded by a conspicuous black spot ringed with white; between the basal patch and central fascia there is an upright blackish bar extending from inner margin to subcostal nervure, and a spot of the same colour on costa; beyond the fascia there are three fine angulated and wavy brownish lines and a broader white one; the apical fourth of costa is marked with blackish, and there is a smaller spot of the same colour on outer margin just below apex; an interrupted brownish band runs from the apical mark to inner margin. Secondaries have the basal half suffused with brownish grey, and the outer half traversed by three fine wavy and angulated lines and a brownish-grey band, but these do not reach the costa. Fringes whitish, chequered with grey, and preceded by a blackish line. Under surface whitish suffused with grey; transverse lines as above; all the wings have a blackish discal dot outlined with whitish.

Expanse 21-25 millim.

Four specimens taken by myself, and three by my native collector, at Hakodate in August.

Hab. Yesso.

—*Cidaria fluviata*.

Geometra fluviata, Hübn. Geom. figs. 280, 281, ♂.

Geometra gemmata, Hübn. op. cit. fig. 283, ♀.

Cidaria fluviata, Hampson, Fauna Brit. Ind., Moths, iii. p. 303.

Hydriomena fluviata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 73.

Several specimens from Yokohama in Pryer's collection.

I obtained examples of this species at Foochow in April, in Satsuma in May, at Gensan in July, and at Nikko in September, and have received a female example from Putsu-fong, taken in June and July.

Distribution. Nearctic region; Chili; Palæarctic region; throughout India, Ceylon, and Burma (*Hampson*); Japan; Corea; Eastern and Western China.

Cidaria pomæriaria.

Cidaria pomæriaria, Eversm. Faun. Volg.-Ural. p. 417 (1844).

Coremia pomæriaria, Guen. Phal. ii. p. 416.

Xanthorhoe pomæriaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 77.

Specimens from Yesso in Pryer's collection; these have

the outer edge of the central fascia less angulated than in typical examples.

Distribution. Europe; Altai; Eastern Siberia; Amur; Yesso.

—*Cidaria saturata*.

Cidaria saturata, Guen. Phal. ii. p. 269 (1857); Hampson, Fauna Brit. Ind., Moths, iii. p. 362 (1895).

Larentia exilivata, Walk. Cat. Lep. Het. xxiv. p. 1195 (1862).

Larentia granitalis, Butl. Trans. Ent. Soc. 1881, p. 426; Ill. Typ. Lep. Het. vii. p. 114, pl. cxxxvii. fig. 8.

Coremia livida, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 449; Ill. Typ. Lep. Het. iii. p. 56, pl. lv. fig. 2 (1879).

Larentia inamœna, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 444 (1879).

There were specimens in Pryer's collection from Yokohama. I captured the species at Nagasaki in June, and have received it from Wa-shan, Moupin, Chang-yang, and Putsu-fong.

Distribution. Natal; N.W. Himalayas; Khâsis; Nilgiris (Hampson); Japan; Kiushiu; Central and Western China.

A very variable species. Among the specimens comprised in my series are examples which agree with the type of *livida*, Butl., others with that of *inamœna*, Butl.; others again represent *granitalis*, Butl., whilst among the intergrades are examples which do not appear to be separable from Dharmasala specimens of *exilivata*, Walk., in the National Collection at South Kensington.

Cidaria angularia, sp. n.

Similar in size, colour, and markings to *C. unidentaria* from Europe, but the inner edge of the central fascia on primaries is rather straighter, and on the outer edge the projection above the middle is not indented; the pale band following the fascia is better defined and the line traversing it is less wavy than the same character in *C. unidentaria*; the outer marginal area beyond the pale band is dusky. Antennæ serrate-fasciculate.

One male specimen and two females from Oiwake in Pryer's collection.

Hab. Japan.

Cidaria designata.

Phalæna designata, Hufn. Berl. Mag. iv. p. 612; Rott. Naturf. xi. p. 85 (1777).

Geometra propugnata, Hübner. Geom. fig. 286.

Coremia propugnata, Guen. Phal. ii. p. 412; Walk. Cat. Lep. Het. xxv. p. 1804.

Xanthorhoe designata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 77.

Specimens were obtained at Hakodate in July and August, and there were a few in Pryer's collection from Yesso.

Distribution. Europe; Altai; E. Siberia; Amur; Japan; Yesso; N. America.

— *Cidaria aridaria*, sp. n.

Primaries pale brown with an ochreous tinge; central fascia broad obscure brown, outlined in blackish, the inner edge is indented below costa, and the outer edge bidentate; submarginal line double, but most distinctly so towards the inner margin, blackish and wavy, beyond it there are two dark clouds, one on costa and one below it, the latter connected with an oblique blackish streak from apex. Secondaries fuliginous grey, with a darker discal spot and indications of a paler central line. Fringes grey, paler on secondaries, and preceded on all the wings by a blackish lunulated line. Under surface grey-brown: the basal two thirds of primaries darker, limited by a paler band which is diffuse on its outer edge; secondaries mottled with darker, the basal two thirds limited by a dusky line followed by a pale band; all the wings have a blackish discal spot.

Expanse 32 millim.

One female specimen from Wa-shan, Western China: June.

— *Cidaria viridata*.

Cidaria viridata, Moore, Proc. Zool. Soc. Lond. 1867, p. 661; Hampson, Fauna Brit. Ind., Moths, iii. p. 365 (1895).

A male specimen from Omei-shan, and a female from Ni-tou: July.

Distribution. Sikhim; Khásis (*Hampson*); Western China.

— *Cidaria ambustaria*, sp. n.

Primaries greyish with a faint olive tinge; basal area suffused with fuscous and traversed by two darker, almost blackish bands; the central fascia fuscous grey, with a median band of the ground-colour, and limited by whitish-edged black lines, the first line wavy and slightly curved, and the second wavy and outwardly produced above the middle; outer marginal area fuscous grey, clouded with darker towards apex and transversely intersected by a wavy whitish line, which is most distinct towards costa. Secondaries pale fuscous grey; basal two thirds suffused with darker and limited by a dusky line which has an obtuse projection at the middle. Fringes: of primaries fuscous grey marked with paler; of secondaries pale fuscous grey marked with darker; preceded by a blackish line in each case. Under surface fuscous, rather paler on secondaries; all the wings have a dusky discal mark and transverse band.

Expanse 22-24 millim.

One male specimen from Che-tou, one from Ta-chien-lu: June and July; and one example (minus head) from Changyang, August.

Hab. Central and Western China.

Cidaria nigrozonaria, sp. n.

Primaries have the basal two thirds fuscous brown, traversed by a pale brown subbasal band; the outer edge of the area is limited by an undulated black line; outer third pale umber-brown traversed by two sinuous brown lines, the outer rather indistinct; apical patch fuscous brown, powdered with grey and marked with black. Secondaries fuscous grey, marked with paler on abdominal area towards anal angle. Fringes pale brown, marked with darker and preceded by a blackish line. Under surface fuscous grey, traversed by darker lines and bands; discal dot on each wing black; fringes umber-brown marked with darker at the ends of the nervules.

Expanse 24-26 millim.

Six male specimens and five females from Oiwake and Yokohama in Pryer's collection.

Hab. Japan.

Cidaria quadrifasciaria.

Phal. Geometra quadrifasciaria, Clerck, Icon. pl. vi. fig. 4; Linn. Faun. Suec. 329.

Coremia quadrifasciaria, Guen. *Phal.* ii. p. 417.

Xanthorhoe quadrifasciaria, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 77.

Scotonia ignobilis, Butl. Trans. Ent. Soc. 1881, p. 423.

There were specimens from Yokohama and Yesso in Pryer's collection. I captured the species at Hakodate in August.

Some of the specimens are much suffused, others agree with the type of "*S.* *ignobilis*", Butl., in the National Collection at South Kensington.

Distribution. Europe; Altai; Eastern Siberia; Amur; Japan; Yesso.

Cidaria dimidiaria.

Cidaria dimidiaria, Motsch. Bull. de l'Acad. 1866, i. p. 197.

A nice series in Pryer's collection. I took the species at Tsuruga and Fushiki in July; and my native collector obtained it in the island of Kiushiu.

Hab. Japan; Kiushiu.

The Kiushiu specimens are smaller than the type and paler in colour.

Oidaria hortulanaria, Grasser, from Amurland, appears to be very near to, if it is not identical with, this species.

Oidaria abraxina.

Melanippe abraxina, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 448 (1879).

A series from Nikko and Yesso in Pryer's collection.

My native collector obtained one female specimen at Hakodate in June.

One of the males, of which sex there are but two examples in the series, is without the central band on each wing, but the discal spot remains.

Hab. Japan and Yesso.

Cidaria fuscaria, sp. n.

Fuscous grey. Primaries have a darker basal patch, its outer edge almost straight, and a blackish central fascia, the inner edge of which is curved, and the outer lobed about the middle; beyond the fascia there are traces of one or two pale waved transverse lines. Secondaries have traces of pale transverse central lines, most distinct on abdominal margin. Under surface fuscous grey, paler on outer marginal area of all the wings.

Expanse 40 millin.

One male specimen from Ta-chien-lu, Western China: June.

Cidaria (?) *fractistriga*.

Epifidonia fractistriga, Alph. Rom. sur Lép. vi. p. 65, pl. iii. fig. 7 (1892).

The specimen (a worn female) taken at Ou-pin in the Province of Kan-sou in July, and referred by Alphéraky to *Epifidonia*, Butl., appears, according to the figure, to agree better with *Cidaria*.

Genus LARENTIA.

(Treit.; Hampson, Fauna Brit. Ind., Moths, iii. p. 367 (1895).)

Larentia plurilinearia, sp. n.

Pale grey traversed by several darker wavy lines, the space between the third and seventh lines is darker and represents a central fascia; the outer margin is bordered with darker. Secondaries have the basal half suffused with

darker. The nervules on all the wings are marked with black and whitish. Fringes concolorous with the wings, preceded by an interrupted blackish line. Under surface smoky grey, the basal area of primaries limited by a blackish, slightly elbowed line, and edged with pale grey; the central area of the secondaries traversed by three dusky lines, and there are traces of a fourth line on the submarginal area.

Expanse 43 millim.

Two male specimens from Ni-tou, July.

Hab. Western China.

— *Larentia lakearia*.

Eubolia lakeuria, Oberth. Etud. d'Entom. xviii. p. 40, pl. iv. fig. 58, ♂, pl. iii. fig. 54, ♀ (1893).

One male specimen from Pu-tsu-fong taken in June or July. Oberthür's types were from Tâ-Tsien-Loû.

Hab. Western China.

— *Larentia pendearia*.

Anticlea pendearia, Oberth. Etud. d'Entom. xviii. p. 39, pl. v. fig. 69 (1893).

Cidaria moupinata, Pouj. Ann. Soc. Ent. Fr. 1895, p. 314, pl. vii. fig. 19.

Oberthür's type was from Ta-chien-lu. I have specimens from the same locality and also from Omei-shan, Ni-tou, and Che-tou. Both sexes are represented. The species occurs in June and July. Poujade records a female example from Moupin.

Hab. Western China.

Larentia grataria.

Anticlea grataria, Leech, Entom., Suppl. p. 52 (May 1891).

Several specimens in Pryer's collection.

I took the species at Nikko in September, and at Oiwake in October.

Hab. Japan.

× *Larentia albigirata*.

Cidaria albigirata, Kollar, Hüg. Kasch. iv. p. 489 (1848).

Cidaria jamesa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 452 (1878); Ill. Typ. Lep. Het. iii. p. 58, pl. lv. fig. 9 (1879).

Larentia albigirata, Hampson, Fauna Brit. Ind., Moths, iii. p. 367 (1895).

Butler's type of *jamesa* was from Hakodate. There were no specimens in Pryer's collection, and I have not received any from Japan.

Distribution. N.W. Himalayas (*Hampson*); Japan (*Butler*).

—*Larentia suffumata*.

Geometra suffumata, Hübn. Geom. fig. 306.

Eutroma suffumata, Hübn. Verz. Schmett. p. 335.

Cidaria suffumata, Treit. Schmett. vi. 2, p. 192; Guen. Phal. ii. p. 468.

Hydriomena suffumata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 73.

Cidaria minna, Butl. Trans. Ent. Soc. 1881, p. 424.

Several specimens from Yokohama and Yesso in Pryer's collection. Also recorded from Tokio.

Cidaria minna, Butl., is most certainly a small form of *C. suffumata*. One of my Japanese specimens measures only 24 millim. in expanse.

The species is common in several localities in Western China.

Distribution. Europe; Altai; Japan; Yesso; Western China.

—*Larentia nitidaria*, sp. n.

Male.—Primaries silvery grey, with a dark chocolate-brown basal patch limited by a curved white line, and a dark chocolate-brown central fascia edged with white, which is broad on the costa but narrow from middle to inner margin; this fascia is apparently broken into three parts, comprising a large triangular costal portion enclosing discal spot, a small median spot, and an upright blotch on inner margin; on the apical area there is a large chocolate-brown patch, which is intersected by a wavy oblique white line extending from apex to the central fascia, which it penetrates for a short distance; submarginal line white, most distinctly seen on the apical patch referred to; there is a reddish-brown shade on the middle of outer marginal area, and the space between the basal area and the central fascia is clouded with blackish. Secondaries grey, suffused with brownish on basal area, and traversed by three pale central lines and a submarginal line, the latter wavy. Fringes of primaries dark grey and of secondaries pale grey. Under surface: primaries fuliginous, with indications of a dark central line agreeing with the outer edge of the fascia of the upperside and a white macular submarginal line; secondaries greyish, with darker central line and discal spot. Antennæ slightly ciliated.

Female.—Similar to the male, but the secondaries appear more like the primaries in colour, that is silvery grey. On the under surface the dark transverse lines are edged with whitish, and there are indications of other whitish wavy lines on the secondaries.

Expanse 40 millim.

One example of each sex from Pu-tsu-fong, June.

Hab. Western China.

—*Larentia fractifasciaria*, sp. n.

Primaries pearly grey, blackish at the base; there is a large black blotch on the costa, this is contracted in the middle and edged with whitish, whilst from its lower end there is a slight projection towards a small upright wedge-shaped spot on the inner margin, the two marks appear to represent the ends of a central band; submarginal line wavy, whitish, with a blackish cloud-like internal edging. Secondaries whiter than the primaries, with a faint dusky central line. Fringes greyish, dotted at the extremities of the nervules with black, and there are two similar black dots on primaries between the apex and the submarginal line. Under surface smoky grey, darker on basal, outer, and costal areas of primaries; the costal blotch faintly reproduced; secondaries rather paler, traversed by faint, dusky, central, and submarginal bands.

Expanse 32 millim.

One male specimen from the plateau to the north-west of Ta-chien-lu.

Hab. Western China.

—*Larentia latifusata*.

Melanippe latifusata, Walk. Cat. Lep. Het. xxv. p. 1208.

Cidaria nemata, Feld. Reis. Nov. pl. cxxxii. fig. 32 (1875).

Larentia latifusata, Hampson, Fauna Brit. Ind., Moths, iii. p. 370 (1895).

Occurs at Moupin, Pu-tsu-fong, Che-tou, Chow-pin-sa, Omei-shan, Chia-ting-fu, Wa-shan, and the Province of How-Kow: June and July.

I have also received the species from Sultanpore, North-west Himalayas.

Distribution. Murree; Dalhousie (*Hampson*); Kulu; Western China.

—*Larentia torpidaria*, sp. n.

Male.—Primaries whitish; basal two thirds greyish, limited outwardly by a darker grey irregular fascia, broadest towards costa and enclosing the black discal spot; submarginal line of the ground-colour, wavy, preceded by brownish clouds towards costa and inner margin, the area beyond this line is suffused with greyish. Secondaries whitish grey, rather darker on outer margin. Fringes whitish grey, preceded by an interrupted blackish line. Under surface of primaries fuliginous grey, with a small pale patch beyond middle of costa; of secondaries whitish powdered with fuliginous grey,

this powdering is thinner on the inner and marginal portions of the outer half of the wing, thus giving the appearance of central and marginal bands.

Female.—Similar to the male, but the fascia of primaries is hardly darker than other portions of basal two thirds.

One example of each sex from Moupin, June.

Hab. Western China.

— *Larentia rotundaria*, sp. n.

Outer margins of all the wings have a very rounded appearance. Primaries have the basal three fourths dark grey, traversed by wavy darker lines, and divided towards the base of the wing by a dark-edged, narrow, pale grey band, the outer edge of which has an angular projection below the middle; the outer limit of this dark area is undulated, conspicuously lobed below the middle, and edged with white on the costa; the outer marginal area is silvery grey, clouded with dark grey exteriorly; there is a short oblique blackish streak from the apex, and the submarginal line is represented by a series of white marks on costa and a series of white dots to inner margin. Secondaries smoky silvery grey. Fringes dark grey. Under surface smoky grey: primaries have an abbreviated white line, shaded with dusky, from costa, and a macular white submarginal line; secondaries have a dusky wavy central line and an interrupted white submarginal line.

Expanse 40 millim.

One male specimen from Moupin, June.

Hab. Western China.

Larentia debilitata.

Cidaria (?) *debilitata*, Leech, Entom., Suppl. p. 52 (May 1891).

One female specimen, from Gifu, in Pryer's collection.

Hab. Japan.

Larentia badiata.

Geometra badiata, Hübn. Geom. fig. 291.

Amazee badiata, Hübn. Verz. Schmett. p. 333.

Articlea badiata, Guen. Phal. ii. p. 407.

Hydriomena badiata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 73.

A few specimens, from Gifu, in Pryer's collection.

Distribution. Europe; Altai; Japan.

The central fascia of primaries and the secondaries are whiter in Japanese specimens than in any example in my European series.

Larentia amelia.

Lozogramma amelia, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 406 (1878);
Ill. Typ. Lep. Het. iii. p. 46, pl. lii. fig. 6 (1879).

There was a nice series from Yokohama in Pryer's collection, and I received a female specimen from Ichang, taken in April.

Distribution. Japan; Central China.

Allied to *L. malvata*, Rbr., a European species which Meyrick places in *Hydriomena* (Trans. Ent. Soc. Lond. 1892, p. 72).

Larentia consanguinea.

Anticlea consanguinea, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 449 (1878); Ill. Typ. Lep. Het. iii. p. 56, pl. lv. fig. 1 (1879).

There were specimens from Yokohama in Pryer's collection.

Hab. Japan.

Larentia umbrifera.

Anticlea umbrifera, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 444 (1879).

Specimens from Yokohama and Oiwake in Pryer's collection. I took the species at Gensan in July, and I received one example from Chang-yang taken in July.

Distribution. Japan; Corea; Central China.

Larentia Taczanowskiaria.

Anticlea Taczanowskiaria, Oberth. Etud. d'Entom. v. p. 54, pl. ix. fig. 8 (1880).

Cidaria pervagata, Christ. Bull. Mosc. 1880, p. 78.

Cidaria Taczanowskiaria, Græser, Berl. ent. Zeit. 1888, p. 418.

There was a nice series from Yesso in Pryer's collection, and my native collector met with the species in Hakodate in June.

Distribution. Amur; Askold; Yesso.

Larentia erebearia, sp. n.

Primaries slaty grey, traversed by numerous blackish lines, three of which are enclosed between two thicker black lines and represent a central fascia; there is also a thicker black line near the base and an interrupted black dash from apex; the latter has a whitish dot on it and there is a similar dot above it on the costa. Secondaries smoky grey, with a brownish tinge within the waved dusky central line; a short slaty-grey streak from abdominal margin. Under surface fuliginous: primaries powdered with slaty grey on costal and

apical areas, and traversed by three or four darker lines beyond the middle; secondaries powdered with grey and traversed beyond the blackish discal spot by several wavy grey lines, the most conspicuous of which is a double one beyond the middle. Body blackish, tip of abdomen in the male brown.

Expanse 36 millim.

Three male specimens and one female from Pu-tsu-fong, June.

Hab. Western China.

—*Larentia stellata*.

Glaucopteryx stellata, Warren, Proc. Zool. Soc. Lond. 1893, p. 367.

Larentia adjouaria, Oberth. Etud. d'Entom. xviii. p. 36, pl. iv. fig. 59 (1893).

Larentia stellata, Hampson, Fauna Brit. Ind., Moths, iii. p. 369 (1895).

Two specimens from Ta-chien-lu, taken in June.

Distribution. Sikkim (*Hampson*); Western China.

—*Larentia naparia*.

Venusia naparia, Oberth. Etud. d'Entom. xviii. p. 30, pl. iii. fig. 36 (1893).

I have received specimens from Ta-chien-lu, Moupin, and Omei-shan, taken in May, June, and July; also from Changyang, taken in May, June, and August.

I took the species at Ningpo in April.

Hab. Central, Western, and North-eastern China.

The specimens from Omei-shan and Ningpo are suffused with fuscous, especially on the under surface.

—*Larentia confusaria*, sp. n.

Greyish white. Basal half of primaries suffused with dark grey and traversed by two diffuse lines of the ground-colour; beyond the middle there is a serrated whitish line clouded inwardly with dark grey; outer margin clouded with dark grey, traversed by a whitish wavy submarginal line. Secondaries whitish, with traces of dark transverse lines on abdominal area and nervules beyond. Fringes dark grey on primaries, paler on secondaries, preceded in all cases by a blackish line. Under surface smoky grey: primaries with a pale band beyond the middle.

Expanse 42 millim.

Two male specimens from Pu-tsu-fong, June.

Hab. Western China.

Larentia nigrifasciaria, sp. n.

Whitish grey, venation blackish. Primaries have a small blackish basal patch, the outer edge of which is quite straight, and a broad blackish central fascia, both edges are undulated, but most prominently so exteriorly, in the centre of the costal portion there is a diffuse spot of the ground-colour abutting on the black discal spot, and there are traces of similar pale spots below; the outer marginal area is clouded and suffused with blackish, and is traversed by a pale wavy submarginal line, which is whitish near costa and inwardly edged with blackish throughout, from this edging black streaks are projected along the nervules. Secondaries have the basal area and outer marginal border darker; the venation also is dark on basal area. Fringes grey, preceded by an interrupted blackish line. Under surface pale grey: basal two thirds of primaries, also apical area, and broad central fascia of secondaries smoky grey; submarginal line of primaries whitish towards costa, darker towards inner margin; beyond the fascia of secondaries the venation is marked with blackish.

Expanse 40 millim.

One male specimen from Pu-tsu-fong, June.

Hab. Western China.

Larentia nudaria, sp. n.

Female.—Primaries grey, tinged with ochreous on outer marginal area; median nervure and branches, also the submedian nervure, marked with black; basal patch and central fascia darker grey, median area of the costal half of the latter of the ground-colour, enclosing a black discal spot; the edges of the fascia are outlined by sinuous black lines, the external one, edged outwardly with white, is preceded by a wavy dusky line; submarginal line white, wavy, expanding into a spot above inner margin; there is a dentated dusky line between the basal patch and inner edge of the fascia, and another between the outer edge of the fascia and the submarginal line. Secondaries whitish grey, suffused with darker on basal area, and traversed by three dark grey lines, the outer two marked with black on the neuration; outer marginal area dark grey, traversed by a whitish submarginal line. Fringes grey, marked with darker on the primaries, and preceded by a black line. Under surface: primaries fuliginous, marked with whitish grey on costa; beyond the middle there is a whitish-grey band edged with blackish; submarginal line whitish, interrupted towards

costa: secondaries whitish grey, traversed by three darker lines; all the wings have a black discal spot.

Expanse 51 millim.

One female specimen from Ta-chien-lu, June.

Hab. Western China.

— *Larentia albiplaga*.

Scotosia albiplaga, Oberth. Etud. d'Entom. xi. p. 34, pl. vi. fig. 42 (1886).

Scotosia nigralbata, Warren, Proc. Zool. Soc. Lond. 1888, p. 327.

Larentia nigralbata, Hampson, Fauna Brit. Ind., Moths, iii. p. 370 (1895).

This species occurred in July and August at most of the localities in Western China visited by my collectors, and also at How-Kow, Thibet.

Distribution. Thundiani; Punjab; Sikhim (*Hampson*); Kashmir; Western China; Thibet.

— *Larentia perplexaria*, sp. n.

Primaries pale ochreous grey; subbasal band oblique, blackish; central fascia not well defined and hardly darker than the ground-colour, except on inner margin where it is blackish, its inner edge is indicated by a wavy oblique line, and its outer edge by an angulated and wavy line, the latter is followed by a wavy whitish band; the outer marginal area is rather darker grey, and is traversed by a whitish line which is broken up into spots, each placed on a black dash towards the costa, where it is joined by an oblique white dash from apex; before this line there is a blackish spot on the costa. Secondaries whitish, traversed beyond the middle by three dusky wavy lines. All the wings have a blackish discal spot. Fringes dark grey on the primaries and whitish marked with dark grey on the secondaries. Under surface: primaries smoky, beyond the middle there is a short diffuse white band from the costa; submarginal line white and rather wavy, united towards costa by an oblique white dash from apex: secondaries as above.

Expanse 32 millim.

One male specimen from Ta-chien-lu, May.

Hab. Western China.

— *Larentia variaria*, sp. n.

Primaries leaden grey; basal patch black, outer edge curved; central fascia black, its inner edge bidentate, and its outer slightly lobed about middle; beyond there is a small black spot on costa, this is outwardly edged with white, and

from it a black waved line, also edged with white, runs to inner margin; submarginal line white and very fine, only distinct towards costa, where it is preceded by an abbreviated black band, and towards inner margin, where it is preceded by a brownish cloud. Secondaries whitish grey, suffused with darker on basal area; discal dot fuscous; central line dusky, slightly waved. Fringes: grey marked with darker on primaries; pale grey marked with darker on secondaries. Under surface fuscous grey: primaries have two dusky transverse lines, edged with whitish, beyond the middle; secondaries have a black discal spot and blackish central line, there are also indications of a dusky line beyond.

Expanse 24 millim.

Three male specimens from Pu-tsu-fong and one from Che-tou, July.

Hab. Western China.

One of the specimens from Pu-tsu-fong is tinged with brownish on primaries. In the Che-tou example the basal patch and the central fascia on upper surface of primaries are not clearly defined; on the under surface the only markings on primaries are some white spots towards costa, representing the submarginal line, and some other white spots above the middle of the inner margin of secondaries.

- *Larentia inconspicua*, sp. n.

Primaries grey, with darker basal patch, subbasal, central, and interrupted outer bands; all these darker markings are limited by fine wavy black lines; submarginal line represented by whitish dots followed by black ones, most distinct towards costa. Secondaries greyish, with paler central band. Fringes pale grey, chequered with darker. Under surface grey, suffused with darker, glossy; the primaries are marked with whitish on the costa and the secondaries have a pale central band.

Expanse 24-26 millim.

Two male specimens from Ta-chien-lu, July.

Hab. Western China.

× *Larentia tæniata*.

Emmoleisia tæniata, Steph. Ill. Brit. Ent., Haust. iii. p. 299, pl. xxxii. fig. 3 (1829).

Hydriomena tæniata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 73.

Coremia fulvida, Butl. Trans. Ent. Soc. Lond. 1891, p. 422.

There were a few examples from Oiwake in Pryer's collection; I obtained specimens at Nemoro in August, and

my native collector met with the species in the island of Kiushiu. Two specimens, which appear to be referable to this species, were received from Pu-tsu-fong and Che-tou; they were taken in July.

In the Japanese specimens the central band of primaries is rather broader than in European examples, and the space between this band and the basal patch is deeply suffused with fuliginous.

Distribution. Europe; Japan; Yesso; Kiushiu; Western China.

Larentia punctilinearia, sp. n.

Primaries greyish brown; basal patch dark brown, becoming blackish on its outer edge, which is slightly dentate; median band dark brown, its inner edge bordered by a dentate whitish line, and dotted with black on the nervules, its outer edge diffuse; beyond the middle there is a whitish line dotted with black on the nervules, and this appears to be the outer limit of the median band; submedian band brown, with ray-like projections in the direction of the fringes, these projections are traversed by a whitish line, and the band is interrupted about the middle by a pale brown patch similar in tint to the space between the basal patch and median band. Secondaries fuscous brown. Fringes pale brown, marked with darker. Under surface brown, with few distinct markings on primaries, but the secondaries have a blackish discal spot and an indented line beyond the middle.

Expanse 32 millim.

One female from Japan in Pryer's collection.

Allied to *L. teniata*, Steph.

— *Larentia promiscuaris*, sp. n.

Primaries pale greyish brown; basal patch darker, limited by a slightly indented blackish band; central fascia broadly blackish, the edges not well defined; between the fascia and basal patch there is a dusky shade; submarginal line whitish, wavy, bordered inwardly by an interrupted blackish band; discal spot black, elongate; fringes dark grey marked with paler, and preceded by an interrupted blackish line. Secondaries whitish; there is a dusky transverse shade beyond the middle, and the fringes, which are of the ground-colour, are preceded by an interrupted blackish line. Under surface whitish: primaries suffused with fuscous, markings of upper surface faintly indicated; secondaries powdered

with fuscous, there are two dusky transverse lines and the discal dot is blackish.

Expanse 25-32 millim.

Four specimens from Chang-yang taken in June, and two from Chow-pin-sa taken in July. Both sexes are represented.

Hab. Central and Western China.

— *Larentia schistacea*.

Anticlea schistacea, Moore, Lep. Atk. p. 273 (1887).

Larentia schistacea, Hampson, Fauna Brit. Ind., Moths, ii. p. 376 (1895).

One male specimen from Omei-shan and one from Pu-tsu-fong: June.

Distribution. Dalhousie; Sikhim (*Hampson*); Western China.

— *Larentia sordidata*.

Geometra sordidata, Fabr. Ent. Syst. 185.

Geometra elutata, Hübn. Geom. fig. 224.

Ypsipetes elutata, Guen. Phal. ii. p. 378.

Hydriomena elutata, Hübn. Verz. Schmett. p. 322; Meyrick, Trans. Ent. Soc. Lond. 1892, p. 72.

Several specimens from Fujisan, Nikko, and Oiwake in Pryer's collection. I have received the species from Omei-shan, Ni-ton, and Pu-tsu-fong, taken in July.

Distribution. Europe; Altai; Amur; Japan; Western China.

— *Larentia neurbouaria*.

Larentia neurbouaria, Oberth. Etud. d'Entom. xviii. p. 36, pl. v. fig. 77 (1893).

I received two male specimens from Pu-tsu-fong, where they were taken in June. Oberthür's type was from Ta-Tsien-Loü.

Hab. Western China.

— *Larentia tripunctaria*, sp. n.

Primaries blackish brown, basal area darker and limited by an indistinct white line; a white blotch on costal area and another below it on inner marginal area represent a central fascia; on the outer marginal area there is a third white blotch; the outer third of the wing is limited inwardly by a sinuous white line followed by a diffuse russet band. Secondaries whitish, basal two thirds suffused with dusky and limited by a blackish wavy line. Fringes agree with the wings in colour. Under surface greyish, blotched with paler on the

middle of the costal and outer marginal areas of primaries; the secondaries have two transverse dotted lines, and the primaries one such line.

Expanse 40 millim.

Two male specimens from Pu-tsu-fong, June.

Hab. Western China.

In the second example the white blotches representing the central fascia are much smaller, especially the lower one, than in the specimen described.

— *Larentia* (?) *intersectaria*, sp. n.

White. Primaries have a black patch at the base containing a yellow spot on the inner margin, the outer edge of this patch is obtusely angled and connected with a small oblong spot at the angle; central fascia black, widely interrupted below the middle; submarginal band represented by a large black spot on the costa and a double series of lunules below to the inner margin; outer margin broadly bordered with black, intersected by an oblique macular white line from apex and interrupted below the middle; there are some yellow marks at inner angle. Secondaries tinged with yellow at the base and anal angle, and marked with black or blackish on the abdominal and outer margins. Under surface as above, but the black markings on basal two thirds of primaries are rather obscured.

Expanse 29 millim.

One male specimen from Omei-shan, July.

Hab. Western China.

— *Larentia* *costipunctaria*, sp. n.

Male with a tuft of hair on the underside of the secondaries placed just beyond the middle of vein 1.

Primaries pale grey, sometimes tinged with ochreous; there are five pairs of indistinct wavy grey transverse lines, the first, third, and fourth commencing in blackish spots on costa and the fifth from the inner edge of a large blackish apical cloud; submarginal line whitish, but only distinctly traceable towards costa and inner margin. Secondaries white, tinged with ochreous on abdominal area and bordered with dark grey on outer margin; submarginal line wavy, pale; central line dusky, wavy, but indistinct. Fringes dark grey, preceded by an interrupted black line. Under surface white; primaries slightly suffused with dusky on basal half; beyond the black discal spot there are indications of a transverse band, but only distinct on the costa; apical

cloud as above; secondaries have a black discal spot and a faint dusky wavy central line, marked with black on the nervules; abdominal area as above; fringes whitish grey.

Expanse 38-41 millim.

Several specimens, including both sexes, from Ta-chien-lu, Moupin, Pu-tsu-fong, Che-tou, and How-Kow: June and July.

Hab. Western China and Thibet.

—*Larentia moniliferaria*.

Trichopleura moniliferaria, Oberth. Etud. d'Entom. xviii. p. 41, pl. v. fig. 76 (1893).

Occurred in most localities in Western China, June and July. Oberthür's type was taken at Tâ-Tsien-Loû (Ta-chien-lu).

Hab. Western China.

—*Larentia truncata*.

Phalana truncata, Hufn. Berl. Mag. iv. p. 602 (1700).

Geometra russata, Hübner. Geom. fig. 305.

Hydriomena truncata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 72.

Cidaria calamistrata, Moore, Proc. Zool. Soc. Lond. 1867, p. 662, pl. xxxiii. fig. 6.

Cidaria cinereata, Moore, l. c.

Cidaria corussaria, Oberth. Etud. d'Entom. v. p. 55, pl. ix. fig. 7 (1880).

Larentia truncata (part.), Hampson, Fauna Brit. Ind., Moths, iii. p. 378 (1895).

There were a few specimens from Yokohama in Pryer's collection. I obtained the species at Nemoro and Shikotan in August, at Nikko in September, and at Oiwake in October. Specimens were received from Moupin and Che-tou, taken in June, and also from the island of Kiushiu.

All the Japanese specimens of *L. truncata* in my collection are modifications of the type form varying in two directions—one graduating towards *cinereata* (*corussaria*), and the other leads up to a variety in which the basal third of the primaries is blackish brown intersected by a dingy rust-coloured band; the central fascia is almost white, the apical patch is unusually large and agrees with the base in colour. The form last referred to is from Oiwake, Yokohama, Kiushiu, and Moupin. The *cinereata* form is represented by specimens from Nemoro, Shikotan, Kiushiu, and Che-tou.

Distribution. Europe; Altai; Amur; East Siberia; Askold; Japan; Kiushiu; Western China.

— *Larentia immanata*.

Geometra immanata, Haw. Lep. Brit. p. 323.

Geometra marmorata, Haw. l. c.

Cidaria immanata, var. *thingvallata*, Staud. Cat. p. 183.

Larentia truncata (part.), Hampson, Fauna Brit. Ind., Moths, iii. p. 378 (1895).

Several specimens from Yokohama in Pryer's collection. I captured examples at Nemoro in the beginning of August, and have received specimens taken in June and July from Chang-yang, Pu-tsu-fong, Che-tou, and the province of How-Kow.

The typical and *marmorata* forms both occur in Japan and China.

Among the Nemoro specimens are two fine varieties; one of these is a very pale modification of the *marmorata* form and the other approaches var. *thingvallata*.

Distribution. Europe; Japan; Yesso; Central and Western China.

— *Larentia bimacularia*, sp. n.

Primaries olive-brown, darker on apical and outer marginal area, and transversely clouded with darker on the basal half of the wing; there is a black patch at the base and an oblong black spot on costa, the latter is connected with a black discal spot and is preceded and followed by double brown lines, the enclosed space paler throughout, but light ochreous on costa; submarginal line pale ochreous from costa to about the middle of outer margin, where it disappears, but is represented by a V-shaped mark before inner angle. Secondaries whitish brown, fuscous grey at the base, and traversed by an oblique fuscous-grey band and two wavy lines of the same colour; on the abdominal margin the space between the lines is pale ochreous; outer margin bordered with fuscous grey, intersected by a pale ochreous curved line, which is angulated above anal angle. Fringes greyish, chequered with blackish. Under surface fuscous grey, marked with darker on the nervules; the primaries are marked on the costa with blackish; submarginal line pale, curved, angulated above inner angle, and bordered inwardly with blackish towards costa; the area beyond the submarginal line is slightly tinged with brownish: all the wings have a blackish discal spot.

Expanse 84–86 millim.

Four female specimens from Ta-chien-lu and one from Pu-tsu-fong: June.

Hab. Western China.

— *Larentia costinotaria*, sp. n.

Primaries pale brownish grey; basal patch black, indented on its outer edge and limited by a pale ochreous line; there is a black oblong mark on the costa—this is outlined in pale ochreous and contracted in the middle; between the black markings there is a dark grey transverse shade from costa to inner margin and some clouds of the same colour below the costal mark; the outer margin is dark grey, indented in the middle; submarginal line represented by a whitish line on the costa, and another towards inner angle. Secondaries pale grey; transverse central line rather darker, edged outwardly with whitish; there are indications of a pale submarginal line. Fringes grey, marked with darker. Under surface fuscous grey; all the wings have a central and a submarginal dusky line, edged with whitish; the central line of primaries is acutely angled.

Expanse 32 millim.

One male specimen from Pu-tsu-fong, July.

Hab. Western China.

Allied to *L. sagittata*, Fabr.

Larentia variata.

Geometra variata, Schiff. Wien. Verz. p. 110; Hübn. Geom. fig. 293.

Geometra obeliscata, Hübn. Geom. fig. 296.

Hydrionena variata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 72.

There were specimens from Gifu in Pryer's collection. I took the species in April at Ningpo and Loochou and in June at Gensan. All the examples are modifications of the *obeliscata* form of the species.

Distribution. Europe; Altai; E. Siberia; Japan; Corea; N.E. China.

x *Larentia comis*.

Larentia comis, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 443 (1879); Hampson, Fauna Brit. Ind., Moths, iii. p. 379 (1895).

There were three specimens in Pryer's collection, one of which was from Oiwake, and I obtained two examples in the same locality in the month of October.

Distribution. Sikhim (Hampson); Japan.

Similar in general appearance to some European examples of *L. variata*, but the antennæ are shortly bipectinate.

The type (in the National Collection) is in poor condition.

Genus OPORABIA.

(Stephens, Ill. Brit. Ent., Haust. iii. p. 273 (1820).)

— *Oporabia* (?) *chiachiarina*.

Psyra chiachiarina, Oberth. Etud. d'Entom. xviii. p. 27, pl. v. fig. 64 (1893).

I have not seen an example of this species, of which Oberthür records two specimens from T'a-Tsien-Lou (Ta-chien-lu); but, judging from the figure, I should say that it is not a *Psyra*, or even referable to the *Boarmiinae*.

Hab. Western China.

— *Oporabia* (?) *productaria*, sp. n.

Primaries pale grey, with a darker basal patch, central fascia, and an ill-defined shade between; the neurulation is still darker and is dotted with whitish, most distinctly beyond the central fascia; submarginal line whitish, wavy. Secondaries: outer angle much produced; whitish grey, suffused with darker on abdominal area; there is a dusky band on outer marginal area traversed by a wavy line of the ground-colour. Fringes agree in colour with the wings and are preceded by an interrupted blackish line. Under surface of primaries fuliginous grey and of secondaries whitish grey finely dusted with darker; all the wings have a blackish discal dot and the secondaries have an obscure, undulated, dusky central line. Antennæ bipectinated.

Expanse 48 millim.

One male specimen from Ta-chien-lu, May or June.

Hab. Western China.

Oporabia nexifasciata.

Oporabia nexifasciata, Butl. Trans. Ent. Soc. 1881, p. 420.

Eight specimens from Yokohama in Pryer's collection.

Very closely allied to *O. dilutata*, Bork., but the antennæ are more strongly fasciculated and the first transverse band of primaries is straight.

Meyrick places *dilutata* in *Asthena* (Trans. Ent. Soc. Lond. 1892, p. 74).

Hab. Japan.

Oporabia japonaria.

Oporabia japonaria, Leech, Entom., Suppl. p. 48 (May 1891).

A long and variable series from Yokohama in Pryer's collection.

Hab. Japan.

Genus PHOTOSCOTOSIA.

Trichopleura, Staud. Stett. ent. Zeit. 1882, p. 68 (præocc.*Photoscotosia*, Warren, Proc. Zool. Soc. Lond. 1888, p. 328.*Lasiogma*, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 70.—*Photoscotosia fasciaria*, sp. n.

Primaries pale grey-brown, traversed by several diffuse dark grey wavy lines; basal patch dark grey; central fascia chocolate-brown, the inner edge slightly indented about the middle and the outer edge angled above the middle and bilobed below it; there are some blackish clouds on the outer margin; the costal portions of the transverse lines are darker, and some blackish dashes precede the marginal line. Secondaries orange, marked with fuscous grey on abdominal area and on outer margin from anal angle to third median nervule. Fringes fuscous, except towards outer angle of secondaries, where they are orange, preceded on all the wings by an interrupted black line. Under surface: primaries pale ochreous, suffused with blackish on basal portion, which is limited by an elbowed blackish band; the apical area is clouded with blackish: secondaries yellowish ochreous, powdered with fuscous; abdominal area greyish; discal spot linear, blackish; central band dusky, almost straight from costa to middle, thence turns sharply to abdominal margin.

Expanse 52–54 millim.

Two male specimens and one female from How-Kow: July.

Hab. Thibet.

—*Photoscotosia amplicata*.*Cidaria amplicata*, Walk. Cat. Lep. Het. xxv. p. 1404 (1862).*Trichopleura amplicata*, Alph. Rom. sur Lép. vi. p. 76, pl. iii. figs. 10 a, b, ♂ (1892).*Trichopleura Dejeani*, Oberth. Etud. d'Entom. xviii. p. 40, pl. iv. fig. 51 (1893).*Photoscotosia amplicata*, Hampson, Fauna Brit. Ind., Moths, iii. p. 382 (1895).

Occurs at Omei-shan, Ni-tou, Pu-tsu-fong, and How-Kow: June and July.

In Chinese specimens the white patch on primaries varies to much the same extent that it does in my series from the N.W. Himalayas, but the secondaries are usually much less suffused with fuscous. One form, however, from Omei-shan seems to merit a varietal name.

—*Var. rivularia*, nov.

General coloration brighter and more variegated; outer transverse line of primaries very conspicuous.

Two male specimens and one female from Omei-shan : July.

Distribution. North-west Himalayas ; Sikkim (*Hampson*) ; Western China ; Thibet.

—*Photoscotosia penguionaria*.

Trichopleura penguionaria, Oberth. Etud. d'Entom. xviii. p. 42, pl. v. fig. 70 (1893).

Three specimens from How-Kow, Thibet : July.

Oberthür's type was from Tâ-Tsien-Loû.

Hab. Western China and Thibet.

—*Photoscotosia bicolor*.

Cidaria bicolor, Moore, Lep. Atk. p. 278 (1887).

Larentia tonchigneuria, Oberth. Etud. d'Entom. xviii. p. 38, pl. v. figs. 67 ♂, 66 ♀ (1893).

Photoscotosia bicolor, Hampson, Fauna Brit. Ind., Moths, iii. p. 382 (1895).

Obtained in June and July in most of the localities in Western China visited by my collectors, and also at How-Kow in Thibet. Oberthür's type was from Tâ-Tsien-Loû.

Distribution. Sikkim (*Hampson*) ; Kulu, North-west Himalayas ; Western China ; Thibet.

—*Photoscotosia albomacularia*, sp. n.

Primaries fuliginous grey, with several indistinct darker transverse lines ; central fascia blackish, with a large diffuse white blotch on its costal portion ; submarginal line whitish, indistinct, and interrupted. Secondaries blackish, discal area white. Fringes blackish, slightly marked with white on secondaries. Under surface blackish ; discal area of primaries white, apices whitish ; discal and abdominal areas of secondaries white, the latter tinged with greyish ; discal spot black, linear.

Expanse 46 millim.

One male example from Omei-shan, July.

Hab. Western China.

Closely allied to *P. bicolor*, Moore, but the band on secondaries is much broader and the fringes are black.

—*Photoscotosia undulosa*.

Trichopleura undulosa, Alph. Stett. ent. Zeit. 1888, p. 69 ; Rom. sur Lép. vi. p. 78, pl. iii. fig. 9, ♀ (1892) ; Oberth. Etud. d'Entom. xviii. p. 40, pl. iv. fig. 50, ♂ (1893).

Photoscotosia undulosa, Hampson, Fauna Brit. Ind., Moths, iii. p. 382 (1895).

One specimen from Omei-shan, July.

Alphéraky's type (a female) was from the province of Szechuen, and that of Oberthür (a male) from Tâ-Tsien-Loû.
Distribution. Thibet ; Sikhim (*Hampson*) ; Western China.

-*Photoscotosia pallifasciaria*, sp. n.

Primaries brown ; basal fourth limited by a pale-edged dark band ; about the middle of the wing there is a broad whitish-brown band, edged inwardly by a narrow undulated dark brown band, and outwardly by a dark brown wavy line, which is slightly indented below costa and shaded inwardly with the ground-colour ; submarginal line pale, arched, terminating in an upright blotch on inner margin ; discal spot black, linear. Secondaries smoky grey, paler on costa ; discal spot black, inconspicuous ; central line dusky, wavy, and curved ; submarginal line arched, ochreous brown, extending from anal angle to third median nervule. Fringes dark grey on primaries, paler, inclining to yellowish, on secondaries, preceded on each wing by a dark brown line. Under surface pale whitish brown : primaries suffused with smoky on basal third and on outer marginal area, especially on apical portion, but the apex itself is of the ground-colour ; beyond the middle there is a blackish abbreviated band from costa ; submarginal line as above ; secondaries powdered with greyish ; discal spot black, linear ; central line dusky, curved.

Expanse 58 millim.

Two female specimens from Che-tou, July.

Hab. Western China.

Allied to *P. undulosa*, Alph.

-*Photoscotosia velutina*.

Photoscotosia velutina, Warren, Novit. Zool. ii. p. 117 (1895).

Warren's type was from "China." I have specimens of both sexes from Omei-shan, Ta-chien-lu, Ni-tou, and Che-tou, where they were taken in July and August.

Hab. Western China.

-*Photoscotosia funebris*.

Photoscotosia funebris, Warren, Novit. Zool. ii. p. 117 (1895).

Specimens, taken in June and July, were received from Pu-tsu-fong, Omei-shan, Ni-tou, and Che-tou.

Warren's type was from "China."

Hab. Western China.

—*Photoscotosia rectilinearis*, sp. n.

Primaries brown, with a pinkish tinge on central area; basal area darker brown, traversed by a greenish-grey band and limited by an almost straight, inwardly diffuse, velvety-black line; beyond the middle there is a greenish-grey wavy band; this is diffuse outwardly and edged inwardly by an interrupted dentated black line; submarginal line indicated by a greenish-grey spot near costa and another towards inner margin; discal spot black, elongate. Secondaries smoky brown, with faint traces of a wavy central line. Fringes brown, except towards apex of secondaries, where they are yellowish. Under surface similar to that of *P. pallifasciaria*.

Expanse 56 millim.

One female specimen from Omei-shan, July.

Hab. Western China.

Photoscotosia atrostrigata.

Scotosia atrostrigata, Brem. Lep. Ost-Sib. p. 87, pl. vii. fig. 16 (1864).

Lasiogma atrostrigata, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 71.

Scotosia lucicola, Butl. Ill. Typ. Lep. Het. ii. p. 54, pl. xxxvii. fig. 10 (1878).

There were several specimens in Pryer's collection. I took the species at Nikko in September and at Oiwake in October. My native collector obtained it on the island of Kiushiu, and I have one specimen from Chang-yang.

Distribution. Eastern Siberia; Japan; Kiushiu; Central China.

—*Photoscotosia apicinotaria*, sp. n.

Male.—Primaries brown; the space between the thin sub-basal black line and the angulated black inner edge of the central fascia, which is paler than the ground-colour, is traversed by wavy blackish lines; the outer edge of the fascia is also black, bidentate, and wavy, but not always well defined; it is preceded by a double brownish line; there is a pale brown spot clouded with darker on costa before apex, and below the spot there is a white dot; discal spot black, linear, connected with the subbasal line. Secondaries fuliginous, whitish on costa; there are indications of a wavy pale brown submarginal line from anal angle to third median nervule, and there is a blackish spot on abdominal margin. Fringes concolorous with the wings, except on upper portion of secondaries, where they are pale brown. Under surface: primaries whitish brown, basal area blackish, apical area fuliginous, the latter enclosing a pale brown triangular spot

on costa towards apex; below this spot there is a dot of the same colour: secondaries whitish brown, powdered with fuliginous, and becoming heavily clouded with fuliginous beyond the wavy central line; discal spot linear.

Female.—Similar to the male, but the exterior outline of the central fascia on primaries is more clearly defined and is bordered with paler towards costa and inner margin; beyond it there are some wavy transverse lines and a white spot towards inner angle; on the secondaries there is a large diffuse orange band extending from costa to third median nervule; the fringes of these wings are tinged with orange towards outer angle. The under surface of primaries is fuliginous, with a broad fulvous central fascia, and of secondaries also fuliginous, tinged on the central area with fulvous.

Expanse, ♂ 54–56, ♀ 58 millim.

Thirteen male specimens and two females from Moupin, Omei-shan, Che-tou, and Ni-tou: June and July.

Hab. Western China.

Photoscotosia propugnataria, sp. n.

Primaries pale olivaceous brown, basal patch and central fascia vinous brown, inner half of central portion paler; the fascia is outlined in black, its interior edge is thrice indented, and there is a black spot in each indentation, the upper one continued to costa; the external edge is wavy and has an obtuse projection about the middle; submarginal line pale, macular below the costa, each spot outwardly edged with black. Secondaries fuscous, whitish grey on costal area, more narrowly towards base; there is an orange cloud at end of the discoidal cell and the fringes on upper half are tinged with the same colour. Under surface very similar to that of *P. fasciaria*, but less ochreous, especially on primaries.

Expanse 54 millim.

One male specimen from Wa-shan: June.

Hab. Western China.

Photoscotosia miniosata.

Scotosia miniosata, Walk. Cat. Lep. Het. xxv. p. 1354 (1862).

Photoscotosia miniosata, Hampson, Fauna Brit. Ind., Moths, iii. p. 380 (1895).

I received this species from Pu-tsu-fong, Che-tou, and from the plateau to the north of Ta-chien-lu.

The specimens do not appear to differ from examples in my collection from the North-west Himalayas.

Distribution. Himalayas; Sylhet; Western China.

Genus CALLABRAXAS.

(Butler, Ann. & Mag. Nat. Hist. (5) vi. p. 226 (1880).)

Callabraxas fabiolaria.

Euchera fabiolaria, Oberth. Etud. d'Entom. x. p. 35, pl. iii. fig. 3 (1884).

This species was obtained at Chang-yang and Ichang, also in most of the localities in Western China.

Hab. Central and Western China.

C. trigoniplaga, Hampson (Trans. Ent. Soc. Lond. 1895, p. 312), is very close to, if not identical with, this species.

Genus GANDARITIS.

(Moore, Proc. Zool. Soc. Lond. 1867, p. 600.)

Gandaritis flavata.

Gandaritis flavata, Moore, Proc. Zool. Soc. Lond. 1867, p. 600; Waterh. Aid, pl. clxxxiv. fig. 7; Hampson, Fauna Brit. Ind., Moths, iii. p. 385 (1895).

Var. *sinicaria*, nov. — Basal two thirds of secondaries white, with a diffuse black central band; outer third blackish, intersected by a wavy yellow band and bordered on outer margin with rather darker yellow.

I have received this form of the species from Moupin, Omei-shan, Wa-shan, Chia-ting-fu, and Chang-yang: June and July.

Distribution. Khâsis (Hampson); North, Central, and Western China.

Gandaritis agnes.

Euchera agnes, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 441 (1878);

Ill. Typ. Lep. Het. iii. p. 47, pl. lii. fig. 10 (1879).

Hydriomena agnes, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 72.

There were four male specimens and one female from Yesso in Pryer's collection. My native collector captured a female example at Hakodate in June or July.

Meyrick considers *festinaria*, Christ., from Amurland, to be synonymous with this species.

Hab. Japan.

Gandaritis maculata.

Gandaritis maculata, Swinh. Ann. & Mag. Nat. Hist. (6) xiv. p. 433 (1894).

Several specimens from Ohoyama, Nikko, and Yesso in Pryer's collection.

Hab. Japan and Yesso.

Gandaritis Fixseni.*Cidaria Fixseni*, Brem. Lep. Ost-Sib. p. 100, pl. viii. fig. 12 (1864).*Gandaritis Fixseni*, Hampson, Fauna Brit. Ind., Moths, iii. p. 385 (1895).*Hydriomena Fixseni*, Meyrick, Trans. Ent. Soc. Lond. 1892, p. 72.

A nice series from Ohoyama, Nikko, and Yesso in Pryer's collection. I obtained the species at Hakodate in August.

Distribution. Eastern Siberia; Amur; Japan; Yesso.

Japanese specimens are larger than the Amurland examples in my collection.

Gandaritis flavomacularia, sp. n.

Allied to *G. Fixseni*.

Male.—Fuliginous. Primaries traversed by several fine wavy and angulated lines; these are whitish or yellowish in colour and only distinct on costal and inner margins; there are indications of two whitish bands on the median area, the first represented by an angular dash on costal area, a sagitta mark on the middle, and a small spot on inner margin, the second by a slightly waved dash on costal area and a small double spot on first submedian nervule; submarginal band formed of whitish spots and the marginal band of yellow ones; all these whitish lines and bands are tinged with yellow on the costa. Secondaries have the abdominal area suffused with smoky grey and the outer angle yellow; submarginal and marginal bands composed of yellow spots, the former preceded on costal area by a yellow crescent-shaped mark, representing a central band. A blackish discal spot on all the wings. Fringes fuliginous, those of secondaries yellow at outer margin and opposite each marginal spot. Under surface yellowish: primaries clouded with brownish on basal and outer marginal areas; central double line brownish, elbowed above the middle, and connected with an interrupted submarginal band of the same colour by an oblique darker cloud; a blackish oblique dash extends from apex almost to submarginal band; secondaries whitish grey on abdominal area and clouded and suffused with yellowish on outer marginal area; central line and submarginal band as on primaries, but the former is curved and has an angular projection on its inner edge before abdominal margin.

Female.—Similar to the male, but larger; the white bands on upper surface of the primaries are less interrupted, as also is the central yellow one of secondaries; the under surface is less yellow and heavily clouded with dusky.

Expanse, ♂ 60, ♀ 66 millim.

One example of each sex from Wa-shan: August.

Hab. Western China.

Genus POMASIA.

(Guen.; Hampson, Fauna Brit. Ind., Moths, iii. p. 337 (1895).)

Pomasia albolinearia, sp. n.

Pale brown. Primaries have a black discal dot and two white transverse lines with black specks on them, the outer one curved and recurved; submarginal line wavy, whitish, but not clearly defined. Secondaries have a black discal dot and a white transverse indented line beyond, the latter inwardly edged with black, most distinctly towards inner margin. Fringes of the ground-colour preceded by a series of black dots. Under surface pale brown, suffused with fuscous on the disk: primaries have a pale discal mark and transverse line beyond: secondaries have a black discal dot and a pale band beyond, the latter inwardly edged with blackish.

Expanse 20 millim.

One male specimen from Chang-yang and an example of each sex from Moupin: July.

In the female specimen from Moupin the white lines are wider and in the male from same locality are almost band-like; but these examples are not in such good condition as the one from Chang-yang, which I have taken as the type.

Hab. Central and Western China.

[To be continued.]

Erratum.

P. 568, line 12, for "entirely black" read "entirely white."

BIBLIOGRAPHICAL NOTICE.

Das Tierreich. I. Lieferung.—*Aves*: Podargidæ, Caprimulgidæ, and Macropterygidæ. Bearbeitet von ERNST HARTERT. Berlin: Friedländer u. Sohn, 1897.

IN the first portion of the Birds in 'Das Tierreich,' which we have lately received, Mr. Ernst Hartert gives an excellent manual of the Goatsuckers and Swifts (Podargidæ, Caprimulgidæ, and Macropterygidæ). As may be supposed, it is based on the portion of vol. xvi. of the 'Catalogue of Birds in the British Museum' containing those families, which was written by him in 1892, thoroughly revised and brought well up to date; but some little alteration is made in the arrangement and in the sequence of the genera, added to which Mr. Hartert has, in the present instance, declared himself wholly for trinomialism, which we rather regret, as we are old-fashioned enough to believe that this is a course that does not tend to the simplification of the study of ornithology, but rather the reverse. The number of species added to those included in the Brit. Mus. Catalogue is fifteen, as follows:—*Podargus intermedius*, Hart.; *Batrachostomus microrhynchus*, Grant; *B. mixtus*,

Sharpe; *Ægotheles rufescens*, Salvad.; *Æ. plumifer*, Ramsay; *Micropsalis kalinowskii*, Berlep.; *Caprimulgus Rosenbergi*, Hartert; *C. nigricapularis*, Rohw.; *C. celebensis*, Grant; *C. aldabrensis*, Ridgw.; *C. Donaldsoni*, Sharpe; *Collocalia Whiteheadi*, Grant; *Cypseloides Cherriei*, Ridgw.; *Apus Willsi* (Hart.); *A. Shelleyi* (Salvad.); but of these *Ægotheles plumifer* and *Apus Shelleyi* were referred to in footnotes in that Catalogue. Besides which the following thirteen subspecies are also added:—*Nyctibius jamaicensis ariacus* (Gm.); *Nuctidromus albicollis derbyanus*, Gould; *Chordeiles virginicus aserriensis*, Chorrio; *Phalaenoptilus Nuttalli nitidus*, Brewst.; *Caprimulgus macrurus ambiguus*, Hart.; *Caprimulgus macrurus nipalensis*, Hart.; *Caprimulgus europæus meridionalis*, Hart.; *Macropteryx mystacea Woodfordiana*, Hart.; *M. comata major*, Hart.; *Collocalia fuciphaga unicolor*, Jord.; *Chotura zonaris pallidifrons*, Hart.; *Apus affinis galilegensis* (Antin.); and *Apus affinis Koenigi* (Rchw.). One new genus is given, viz. *Nannochordeiles*, Hartert [type *N. pusillus* (Gould)], and the following alterations and emendations are made:—*Ægotheles Loriae* (Cat. B. Brit. Mus. xvi. p. 650) is omitted; *Eurostopus* is corrected (p. 23) to *Eurostopodus*; *Macropsalis forcipata* (p. 27) to *M. creagra* (Bp.); the genus *Cosmetornis* is suppressed and included (p. 30) in *Macrodipteryx*, and *M. macrodipterus* is corrected to *M. longipennis* (Shaw); *Heliothreptus* is altered (p. 31) to *Eliothreptus*; *Caprimulgus lentiginosus* stands (p. 55) now as *C. trimaculatus* (Sw.), *Caprimulgus jota* as *Caprimulgus indicus jota*, and *Caprimulgus Kelaarti* as *Caprimulgus indicus typicus*; *Collocalia merguensis* as *C. francica germani* (Oust.); *Tachornis batasiensis* is altered to *T. batasiensis*; and the generic name for the true Swifts is altered from *Micropus* to *Apus*, but should, we think, stand as *Cypselus*. Sixteen woodcuts of heads, feet, and tails are given, all of which will be found useful, and the entire work is well got up and conscientiously executed; and we congratulate Mr. Hartert on having completed so concise and useful a manual of these families.

MISCELLANEOUS.

On the Malpighian Tubes of Orthoptera.

By M. L. BORDAS*.

THE Malpighian vessels in Orthoptera present a close analogy with those of Hymenoptera so far as their number and length is concerned, but they differ essentially in their arrangement and mode of opening. They are, as a rule, capillary tubes, more or less elongated, cylindrical, tortuous, and arranged in several bundles which open in the majority of species on the summit of six little conical tubercles, arising in evaginations of the anterior extremity of the terminal portion of the intestine. In Forficulidæ, Phasmidæ, and Gryllidæ the relations of these glands to the intestine are entirely different.

From the histological point of view these glands consist of an external very delicate peritoneal coat and an internal epithelium

* Abstract from a work, 'Appareil digestif des Orthoptères.'

lying upon a very thin basement membrane. The epithelium is formed of a number of excretory cells, varying with the species, and encloses a very fine central lumen.

Among the various excretory products of these glands I have found abundance of sodic and calcic urate in *Gryllus*; uric acid in *Gryllotalpa* in the form of irregular spherical or ovoid concretions and prismatic crystals; sodic urate and uric acid in *Blatta* and *Periplaneta*.

The research has been made on about eighty species, belonging to seven principal families of the Orthoptera, and I will now proceed to describe the results, insisting specially on the mode of opening of the Malpighian tubes. Further, thanks to the numerous specimens placed at our disposal, I have been enabled to observe the diverse modes of opening which the urinary organs affect in Orthoptera, and to follow out all the phases between the two extreme types—that is to say, those in which the tubes of Malpighi open into the end of the intestine at the summit of a number of tubercles grouped in circles, and those in which they form only one large bundle, opening at the end into a long urethral tube dilated at the extremity.

We will pass in review the several families in the order of diminution of complication.

The tubes of Malpighi in the Forficulidæ are small in number (8 to 10) and grouped in two bundles placed at the ends of a diameter at the origin of the terminal intestine.

In the Phasmidæ the urinary organs are very numerous and united in several bundles (20 to 24 in *Phibalosoma*), opening into an equal number of hemispherical or conical tubercles, very short and disposed in a circle around the intestine, of which they are nothing more than simple evaginations. In *Acanthoderus* and *Necroscia* each collecting-tubercle receives but two or three Malpighian tubes.

The Mantidæ possess 60 to 70 urinary tubes, inserted sometimes irregularly, sometimes grouped in bundles (3 or 4) at the origin of the terminal intestine (*Eremiaphila*). The Praying Mantis possesses 50 or 60, united in several bundles separated by narrow free spaces.

In *Periplaneta* and *Blatta* the Malpighian tubes are grouped in 6 bundles, each comprising 15 to 20 tubes opening on the summit of a very short conical tubercle. These six tubercles, greatly reduced and with a broad base, arise from intestinal evaginations. They are about equidistant from one another and arranged in a circle around the intestine. The urinary organs of *Polyzosteria* are thin, short, winding, and arranged equally in six groups. In *Blaber* the mode of opening of the tubes of Malpighi is altogether characteristic and quite different from that observed in other Blattidæ. The tubular glands, to the number of 50 or 60, open on an irregular area comprising about one third of the circumference of the intestine.

In the family of the Acrididæ the number of Malpighian tubes is very variable, certain species (*Pezilocerus*, *Pyrgomorpha*) having as many as 100; others have 60 to 70 (*Pamphagus*), and some 70 to 80 (*Edipoda*) or 50 to 60 (*Psophus*, *Pachytylus*, &c.). In all

these species these organs are grouped in a small number of bundles (5 or 6), directed, some backwards, some forwards, and covering partly the middle and partly the posterior intestine. In all the Locustidæ the number of the tubes of Malpighi exceeds 100. They are grouped in six bundles, opening at the summit of six cylindro-conical tubercles, sometimes disposed irregularly, sometimes at equal distances one from the other, at the origin of the terminal intestine (*Locusta*, *Decticus*, *Salomona*, *Pseudorhynchus*, *Platycleis*, &c.). In the Ehippigerinæ there are only 3 or 4 of these conical tubercles, with 110 to 120 urinary tubes. Lastly, through *Gryllacris*, which has, as a rule, but one collecting-tubercle, fairly short, on the summit of which 80 to 100 Malpighian tubes open, we pass to the Gryllidæ. The number of tubes in various Gryllidæ is very considerable, and exceeds 100; 100 to 120 may be counted in *Gryllus* and *Gryllotalpa*. These organs are long, tortuous, and open at the widened end (pan-shaped) of a single cylindrical collecting-canal (ureter). This last, after a course of 9-12 millim., penetrates a little below the origin of the terminal intestine, and there opens on the summit of a conical or dolioform tubercle, with a blunted point and armed with four valves bounding a star-shaped orifice (*Gryllotalpa*).—*Comptes Rendus*, tom. cxxiv. pp. 46-48.

The supposed great Octopus of Florida: certainly not a Cephalopod.

By A. E. VERRILL.

Additional facts have been ascertained and specimens received that render it quite certain that this remarkable structure is not the body of a Cephalopod. It was described by me, in the January number of this Journal [also 'Annals,' Feb. 1897], as the body of an Octopus*, from the examination of a number of photographs and the statement made to me that, when it was first cast ashore, stumps of arms were found adherent to one end, one of which was said to have been 36 feet long†. Subsequently, when it was excavated and moved, this statement proved to be erroneous. Apparently nothing that can be called stumps of arms or any other appendages were present. Folds of the integument and mutilated and partly detached portions may have been mistaken for such structures. No bones or other hard parts were found in it.

* Many other zoologists who examined the photographs held the same opinion. Some of those who have seen the samples of integument sent to me still believe that the specimen may be the body of some unknown genus of Cephalopoda, allied to *Octopus*. But the thick integument of a Cephalopod is necessarily muscular and highly contractile, while in this creature it is elastic and resistant, and not at all contractile. Therefore I cannot refer it to that group, after having examined this structure.

† The following is the written statement made by Mr. Wilson to Dr. Webb in regard to the "arms" that he found when it first went ashore:—"One arm was lying west of body, 28 feet long; one stump of arm west of body, about 4 feet; three arms lying south of body, and from appearances attached to same (although I did not dig quite to body, as it laid well down in the sand, and I was very tired), longest one measured over 32 feet; the other arms were 3 to 5 feet shorter." Soon after this examination the specimen went adrift in another severe storm and was again cast ashore two miles further south, which will probably account for the loss of these supposed arms.

Dr. Webb has recently sent to me several large masses of the integument of the creature, preserved fairly well in formalin. These masses are from 3 to 10 inches thick, and, instead of being muscular, as had been thought, they have a structure similar to the hard elastic variety of blubber-like integument found on the head of certain cetaceans, such as the sperm-whale. They contain very little oil and cannot be called true blubber. They are firm, very tough and elastic, and composed mainly of much interlaced fibres and large bundles of tough, fibrous, white connective tissue. They are difficult to cut or tear apart, especially where indurated by partial drying. Some large irregular canals permeate the inner and less dense portions of the thick masses. These may have contained blood-vessels originally. From the inner surface of some of the pieces large cords of elastic fibres proceeded inward. These now hang loosely from the masses of integument. Dr. Webb states that these were found attached on all sides to a long saccular organ, which occupied most of the central cavity of the great mass. No muscular fibres were present in the specimens sent. Perhaps the muscular tissues of the inner surfaces, if any were present originally, have decayed, but the tough fibrous mass does not show much decomposition. The outer surface shows in some places a tough, thin, grey, rather rough skin-like layer, that may be the remains of the outer skin. It looks a little like the skin of some fishes from which the scales have been removed. From these facts I am led to believe that the mass cast ashore is only a fragment, probably from the head, of some huge vertebrate animal covered with a blubber-like layer of great thickness.

Although such an integument might, perhaps, be supposed compatible with the structure of some unknown fish* or reptile, it is certain that it is more like the integument found upon the upper part of the head of a sperm-whale than anything else that I know. If we could imagine a sperm-whale with the head prolonged far forward in the form of a great blunt saccular snout, freely projecting beyond the upper jaw, and with a great central cavity, it might, if detached and eroded by the surf, present an appearance something like the mass cast ashore. It hardly seems possible, however, that the abruptly truncated and narrow snout of the common sperm-whale could take on, even after being long tossed about by the waves, a form like this. No whaler who has seen it has recognized it as any part of a whale. It does not seem possible to identify such a large, hollow, pear-shaped sac, 21 feet long, with any part of an ordinary sperm-whale unless its nose had become enlarged and distorted by disease, or possibly by extreme old age. No blowhole was discovered.

The specimen has now been moved several miles nearer to St. Augustine and enclosed by a fence to protect it from the drifting sand. It is likely to remain in nearly its present state for several months more.—*Amer. Journ. Sci.*, April 1897, pp. 355, 356.

* The integument of *Orthogoriscus mola*, the great sun-fish, is very thick and elastic, but unlike this in structure.

INDEX to VOL. XIX.

- ABRAXAS**, new species of, 447.
Acanthothenus, new species of, 103.
Acaulona costata, remarks on, 28.
Achatina, new species of, 636.
Acraea, new species of, 581.
Admetinae, note on the new sub-family, 358.
Aganippe, note on the genus, 112.
Air-spaces in flying animals, on the, 149.
Akodon, new species of, 496.
Alcidamea, new species of, 400.
Ambulyx, new species of, 580.
Ammodytes tobianus, on the spawning of, 241.
Ammoplanus, new species of, 402.
Anaitis, new species of, 553.
Ancara, new species of, 167.
Andrews, C. W., on the structure of the skull of a *Pliosaur*, 350; on a cast of the brain-cavity of *Iguanodon*, 585.
Andricus, new species of, 261.
Anidiops, characters of the new genus, 114.
Animals, on the air-spaces in flying, 149; on movement in a circle as the fundamental form of movement in, 155; on nocturnal protective coloration in, as developed by natural selection, 354.
Anonychia, new species of, 225.
Antennophorus Uhlmanni, on the relations of, to *Lasius mixtus*, 620.
Antheraea, new species of, 393.
Aparallactus, new species of, 154, 279.
Apericallia, characters of the new genus, 211.
Arachnida, new, 78, 109, 116, 283, 360, 510.
Arichanna, new species of, 434.
Arinia, new species of, 627.
Assimineae, new species of, 639.
Astacus, on the generic name, 120, 289, 352, 353, 470.
Asthpa, new species of, 173.
Auzea, new species of, 182.
Baccha phaeoptera, remarks on, 20.
Bapta, new species of, 198.
Batrachia, new, 10, 106, 508.
Bell, F. J., on the generic name of the river crayfish, 239.
Bembidula, new species of, 371.
Biston, new species of, 322.
Boarmia, new species of, 340, 418.
Books, new:—Hampson's *Moths of British India*, Vol. IV., 236; Theobald's *Parasitic Diseases of Poultry*, 237; Hartert's *Das Tierreich*, I. Lief.—*Aves*, 679.
Bordas, L., on the Malpighian tubes of *Orthoptera*, 680.
Boulenger, G. A., on new lizards and frogs from New Guinea, 6; on new Malay frogs, 106; on a new snake from Sierra Leone, 154; on a new fish from Lake Nyassa, 155; on reptiles and batrachians from the Congo Free State, 270; on a new snake from Usambara, 281; on a new lizard from Obok, 467; on a new genus and species of tortoises from Borneo, 468; on reptiles and batrachians from Lombok &c., 503.
Bouvier, E.-L., on the organization and affinities of *Pleurotomaria*, 583.
Broteochactas, new species of, 364.
Brotheas, observations on the genus, 367.
Buliminus, new species of, 637.
Butler, Dr. A. G., on the sexes of *Charaxes mixtus*, 124; on a new butterfly from Borneo, 460; on a new African species of *Mylothria*, 627.
Bylazora, new species of, 333.
Cambridge, F. O. P., on the *Oleniform* spiders of the New World, 32.
Cameron, P., on new *Hymenoptera* from Central America, 261, 363.
Campsurus Pictati, definition of the new name, 616.
Carige, new species of, 552.
Cathypna, new species of, 681.
Caturus, new species of, 292.
Caullery, M., on *Spirorbis*, 411.
Centris, new species of, 394.
Cephalopod, on a gigantic, on the Florida coast, 240, 682.

- Cerocotis*, new species of, 501.
 Chapman, F., on Ostracoda from the Chera-marl of Hitchin, 591.
Charaxes mixtus, on the sexes of, 124.
Chilomya, definition of the new genus, 501.
 Chilton, Dr. C., on a new Amphipod from New Zealand, 1.
Chrounia, new species of, 155.
Chrysis, new species of, 401.
Chrysops costatus, remarks on, 18.
Cidaria, new species of, 643.
Cirina, new species of, 393.
Cistogaster immaculata, remarks on, 81.
 Cockerell, T. D. A., on bees of the genus *Colletes* from New Mexico, 39; on new Hymenoptera from New Mexico, 394.
 Coleoptera, new, 389, 478, 501, 577.
Colletes, new species of, 39.
Cottus scorpius, on the life-history of, 256.
 Crayfish, on the name of the, 120, 239, 352, 353, 470.
Crocallis, new species of, 221.
Crocota, new species of, 319.
 Crustacea, new, 1.
Cryptoloba, new species of, 165, 550.
Ctenus, note on the genus, 57, 73; new species of, 78.
Cupha, new species of, 174.
Cycadeoidea, new species of, 119.
Cyclophylla, new species of, 613.
Cyclopterus lumpus, on the life-history of, 245.
Cylindrophis, new species of, 506.
Dalina, new species of, 106, 215.
Dacatoma, new species of, 503.
Decetia, new species of, 183.
Delias, new species of, 408.
Delma, new species of, 170.
Dendrelaphis, new species of, 507.
Deridea, new species of, 389.
Diglena, new species of, 630.
Dilinia, new species of, 315.
Dilophodes, new species of, 454.
Diomea, new species of, 169.
Diplommatina, new species of, 626.
 Diptera, new, 16, 140.
 Distant, W. L., on Homoptera from South Africa, 125; on a new species of *Pæcilopsaltria*, 262; on Heterocera from the Transvaal, 360, 579; on Coleoptera from the Transvaal, 575.
Doleschallia Comrii, description of the male of, 174.
 Druce, H. H., on new *Lycænidæ* from the Eastern Archipelago, 13.
Echinomyia, new species of, 148.
 Elles, Miss G. L., on the subgenera *Petalograptus* and *Cephalograptus*, 351.
Elymnias, new species of, 178.
Emmecosmia, new species of, 546.
Engystoma, new species of, 108.
Ennea, new species of, 634.
Epiplema, new species of, 185.
Epyria, new species of, 273.
Eremias, new species of, 407.
Eristalis, new species of, 21.
Eublemma, new species of, 167.
Eubolia, new species of, 554.
Eucyrtops, characters of the new genus, 113.
Eulepis, new species of, 408.
Euplexidia, characters of the new genus, 165.
Euprostenops, definition of the new name, 110.
Eurymene, new species of, 227.
Eustroma, new species of, 563.
 Fischer, H., on the organization and affinities of *Pleurotomaria*, 583.
 Fishes, new, 155, 292, 379.
Gadus pollachius, on the eggs and young of, 243.
Gagrella, new species of, 283.
 Gahan, C. J., on the longicorn genus *Glenea*, 473.
Gandaritis, new species of, 678.
Gathynia, new species of, 187.
Gazella, new species of, 162.
Genuchus, new species of, 578.
 Geological Society, proceedings of the, 119, 238, 350.
Glenea, on the longicorn genus, 473; new species of, 478.
Gnophos, new species of, 327.
Graphiurus, new species of, 388.
 Gregory, Dr. J. W., on the affinities of the Echinothuridae, 238; on *Echinocystis* and *Palaodiscus*, 239.
 Guldberg, Prof. F. O., on movement in a circle as the fundamental form of movement in animals, 155.
 Günther, Dr. A., on a new species of *Delma*, 170.
Hadrus lepidotus, remarks on, 19.

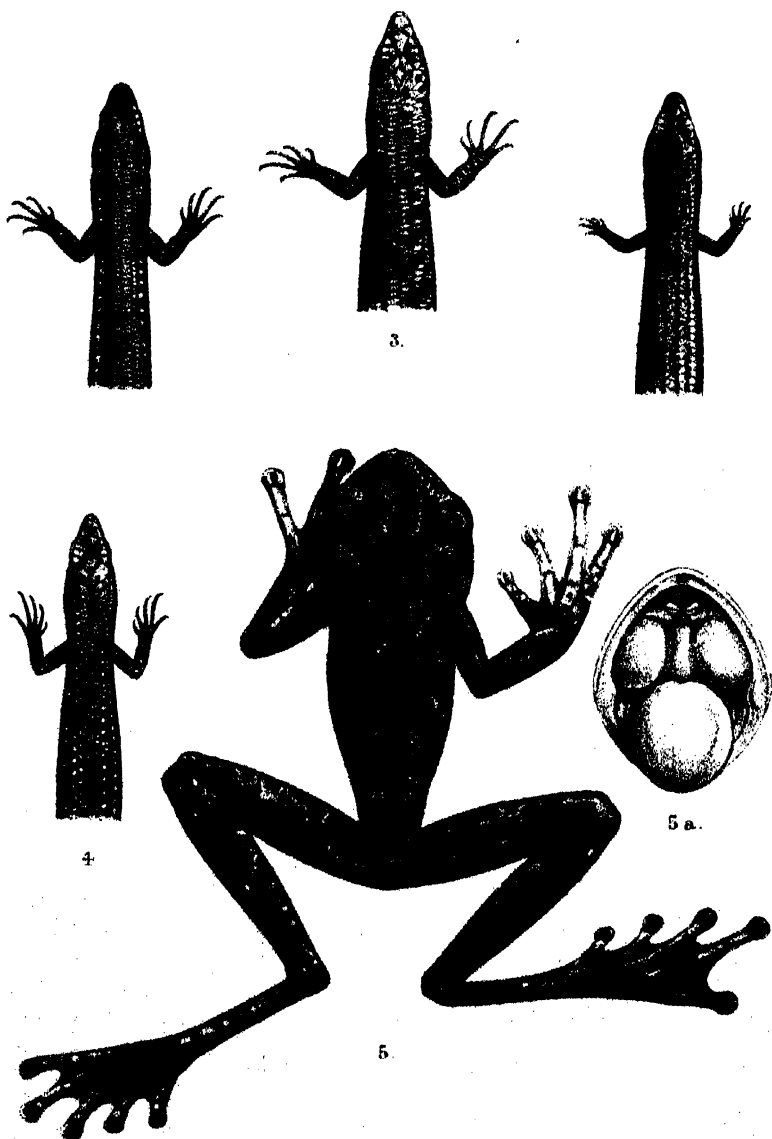
- Hapalus*, new species of, 635.
Hemerophila, new species of, 481.
Hemiptera, new, 125, 282.
Herpa, new species of, 166.
Heterocallia, characters of the new genus, 212.
Heteroclitia, new species of, 577.
Heteroglenea, characters of the new genus, 400.
Heterolocha, new species of, 228.
Holochila, new species of, 179.
Holochilus, new species of, 495.
Huphina, new species of, 405.
Hybernia, new species of, 320.
Hyla, new species of, 509.
Hymenoptera, new, 39, 261, 368, 394.
Hypolimnas, new species of, 175, 406.
Idiosoma sigillatum, note on, 100.
Iguanodon, on a cast of the brain-cavity of, 585.
 Ihering, H. v., on the biology of the social wasps of Brazil, 133.
 Insects, on nocturnal protective coloration in, as developed by natural selection, 354.
Ixalus, new species of, 106.
 Janet, C., on the relations of *Antennophorus Uhlmanni* to *Lasius mixtus*, 620.
 Kirby, W. F., on Neuroptera from the Amazons, 598.
Krananda, new species of, 305.
Labdacus, new species of, 91.
Lagidium, new species of, 467.
Lampides, new species of, 179.
Larentia, new species of, 655.
Lasius mixtus, on the relations of *Antennophorus Uhlmanni* to, 620.
 Leech, J. H., on Lepidoptera Heterocera from China, Japan, and Corea, 180, 297, 414, 543, 640.
 Lendenfeld, Prof. R. v., on some sponges from the Auckland Islands, 124; on the physiological importance of the air-spaces in flying animals, 149.
Lepadogaster bimaculatus, on the eggs and young of, 252.
Lepidoptera, new, 13, 164, 172, 180, 297, 393, 403, 407, 414, 469, 543, 580, 581, 627, 640.
Leptodira, new species of, 281.
Liemys, characters of the new genus, 468.
Ligia, new species of, 449.
Liophryne, characters of the new genus, 11.
Lobogonia, new species of, 550.
 Lobster, on the name of the, 120, 352, 353, 470.
Locris, new species of, 131.
Lophuron, new species of, 580.
Loxaspilates, new species of, 234.
Lutra, new species of, 618.
Luxiaria, new species of, 304.
Lycotenus, characters of the new genus, 95.
Lydoceras, new species of, 501.
Lygosoma, new species of, 6, 504.
Lygranoa, new species of, 543.
Macaria, new species of, 307.
 McIntosh, Prof., on the spawning of *Ammodytes tobianus*, 241; on the eggs and young of *Gadus pollachius*, 243; on the life-history of *Cyclopterus lumpus*, 245; on the eggs and young of *Lepadogaster bimaculatus*, 252; on the life-history of *Cottus scorpius*, 256.
 Major, Dr. C. I. F., on *Sus verrucosus* and allies, 521; on the Otter of Central America, 618.
Malacomys, new species of, 465.
Mammals, new, 161, 162, 349, 388, 463, 466, 494, 574, 618.
Mantophryne, characters of the new genus, 12.
Mastigocerca, new species of, 631.
Mecodina, new species of, 168.
Medasina, new species of, 432.
 Melvill, J. C., on new S. African Mollusca, 633.
Meromacrus crucigerus, remarks on, 22.
 Meunil, F., on *Spirorbis*, 411.
Metabraxas, new species of, 451.
Miathyria, new species of, 600.
 Michael, A. D., on the classification of Oribatidae, 34.
Microthyria, new species of, 608.
Microhyla, new species of, 108.
Milesia, new species of, 142.
Mollusca, new, 623, 633.
Monomatapa, characters of the new genus, 129.
Mus, new species of, 349, 463.
Mustella melampus, new subspecies of, 161.
Mylothris, new species of, 627.
Myrteta, new species of, 195.
Nadagara, new species of, 302.
Nausigaster, new species of, 20.

- Naxa*, new species of, 545.
Nectomys, new species of, 498.
Neolythria, new species of, 461.
Neptis, new species of, 407.
Neuroptera from the Amazons, on, 598; new, 600.
Notommata, new species of, 628.
Nyctimantia, new species of, 12.
Obeidia, new species of, 458.
Oberthürria, characters of the new genus, 183.
Odonestria, new species of, 410.
Oncopus, new species of, 285.
Ophthalmodes, new species of, 335.
Opiliones, new Oriental, 283.
Opiathacanthus, new species of, 116.
Oporabia, new species of, 671.
Oribatidæ, on the classification of, 34.
Orthoptera, on the Malpighian tubes of, 680.
Oryzomys, new species of, 494.
Osteorachia, new species of, 379.
Ostracoda from the Chara-marl of Hitchin, on, 591.
Papilio, new species of, 172.
Paropioxys, new species of, 130.
Parthenos, new species of, 177.
Pedipalpi from the Lower Amazons, on, 367.
Pelitus, new species of, 283.
Penthosia satanica, remarks on, 32.
Peronia, new species of, 455.
Perdita, new species of, 398.
Pericallia, new species of, 207.
Perilampus, new species of, 265.
Perithemis, new species of, 602.
Perrier, E., on *Spirorbis*, 412.
Pettalus, new species of, 289.
Phibalapteryx, new species of, 562.
Phigalia, new species of, 321.
Philiris, new species of, 15.
Phoneutria, note on the genus, 57.
Photoscotosia, new species of, 672.
Phyllabraxa, characters of the new genus, 441.
Phyllosphingia, characters of the new genus, 164.
Pipiza, new species of, 140.
Planorbis, new species of, 638.
Platyischnopus, new species of, 2.
Platypleura, new species of, 128.
Plamyria, new species of, 571.
Pleurotomaria, on the organization and affinities of, 583.
Pecock, R. I., on trapdoor spiders from Australia, 109; on new scorpions from East Africa, 116; on new Oriental *Opiliones*, 283; on the names of the lobster and the crayfish, 352; on *Scorpiones* and *Pedipalpi* from the Lower Amazons, 357; on new scorpions of the genus *Tityus*, with notes on forms allied to *T. americanus*, 510.
Podalirius, new species of, 399.
Podium, new species of, 368.
Pæcilopsaltria, new species of, 126, 282.
Polistes, on the habits of the genus, 133.
Polybia, on the habits of species of, 133.
Pomasia, new species of, 679.
Pompilus, new species of, 374.
Ponsonby, J. H., on new S. African *Mollusca*, 633.
Proales, new species of, 629.
Prosymna, new species of, 278.
Pseudagenia, new species of, 372.
Psychostrophia, new species of, 189.
Payra, new species of, 212.
Pupa, new species of, 633.
Pupina, new species of, 625.
Rana, new species of, 508.
Rapala, new species of, 409.
Reed, F. R. C., on the fauna of the Keisley limestone, 119.
Registoma, new species of, 626.
Remigia, new species of, 168.
Reptilia, new, 6, 154, 170, 278, 281, 467, 468, 504.
Rhynchobapta, new species of, 303.
Rotifera, new American, 628.
Rumia, new species of, 298.
Salix, new species of, 372.
Scardamia, new species of, 202.
Sciurus, new species of, 574.
Scotosia, new species of, 555.
Selenia, new species of, 205.
Seleniopsis, new species of, 224.
Selidosema catoteniaria, new variety of, 336.
Seward, A. C., on a new Cycadean stem from the Isle of Portland, 119.
Sharpe, Miss E. M., on new species of *Acræidæ* from Uganda, 581.
Sisyrophora, new species of, 170.
Smicra, new species of, 262.
Smith, E. A., on new land-shells from the Malay Archipelago, 623.
Smith, H. G., on new butterflies from the Pacific Islands, 172, 403.

- Sphaerophthalma*, new species of, 376.
Sphenophryne, new species of, 10,508.
Spheg, new species of, 370.
Spiders, on the *Cteniform*, of the New World, 52; on trap-door, from Australia, 109.
Spilochalcis, new species of, 403.
Spilopera, new species of, 300.
Spirorbis, notes on, 411.
Sponges from the Auckland Islands, note on some, 124.
Stebbing, Rev. T. R. R., on the names of the lobster and crayfish, 120, 353, 470.
Stegania, new species of, 203.
Stenoctenus, new species of, 92.
Stictoploea, new species of, 173.
Stictoptera, new species of, 167.
Stokes, Dr. A. C., on new American *Rotifera*, 628.
Stylocellus, new species of, 291.
Stylogaster, notes on the genus, 23; new species of, 24.
Subulina, new species of, 637.
Sus barbatus, new subspecies of, 534.
 — *verrucosus* and allies, observations on, 521; new subspecies of, 524.
Swinhoe, Col. C., on new Eastern *Lepidoptera*, 164, 407.
Synegia, new species of, 204.
Synopsia, new species of, 430.
Tenaris, new species of, 177.
Tephрина, new species of, 312.
Tephrosia, new species of, 339.
Thomas, Mrs. M. K., on the genus *Deridea*, Westwood, 389; on new species of *Mylabrinæ*, 501.
Thomas, O., on the *Tau-shima* representative of the Japanese sable, 161; on a new gazelle from Central Arabia, 162; on a new dormouse from Mashunaland, 388; on a new species of *Lagidium* from Patagonia, 466; on some South-American *Muridæ*, 494.
Thysonotis, new species of, 13.
Tityus, new species of, 360, 510; on the forms allied to *T. americanus*, 516.
Townsend, C. H. T., on *Diptera* from the Rio Nautla, 16; from Southern New Mexico, 138.
Trachycystis, new species of, 635.
Trichopoda, new species of, 29.
Trigonalys, new species of, 267.
Typhlops, new species of, 505.
Uracis, new species of, 605.
Urapteryx, new species of, 190.
Uroplectes, new species of, 118.
Venilia, new species of, 233.
Verrill, A. E., on a gigantic cephalopod on the Florida coast, 240, 682; on nocturnal protective coloration in mammals, birds, fishes, insects, &c., as developed by natural selection, 354.
Wasps, on the biology of the social, of Brazil, 133.
Winton, W. E. de, on a new mouse from Damaraland, 349; on two new *Muridæ* from Central and West Africa, 463; on the ochre-footed scrub-squirrels of E. Africa, 573.
Woodward, A. S., on the osteology of *Caturus* and *Osteorachis*, 292, 379.
Xandrames, new species of, 327.
Xesta, new species of, 623.
Xyloscia, new species of, 210.
Zanclopera, new species of, 306.
Zethenia, new species of, 228.
Zethes, new species of, 169.
Zeuxaltis, characters of the new sub-genus, 470.
Zeuxidia, new species of, 470.

END OF THE NINETEENTH VOLUME.

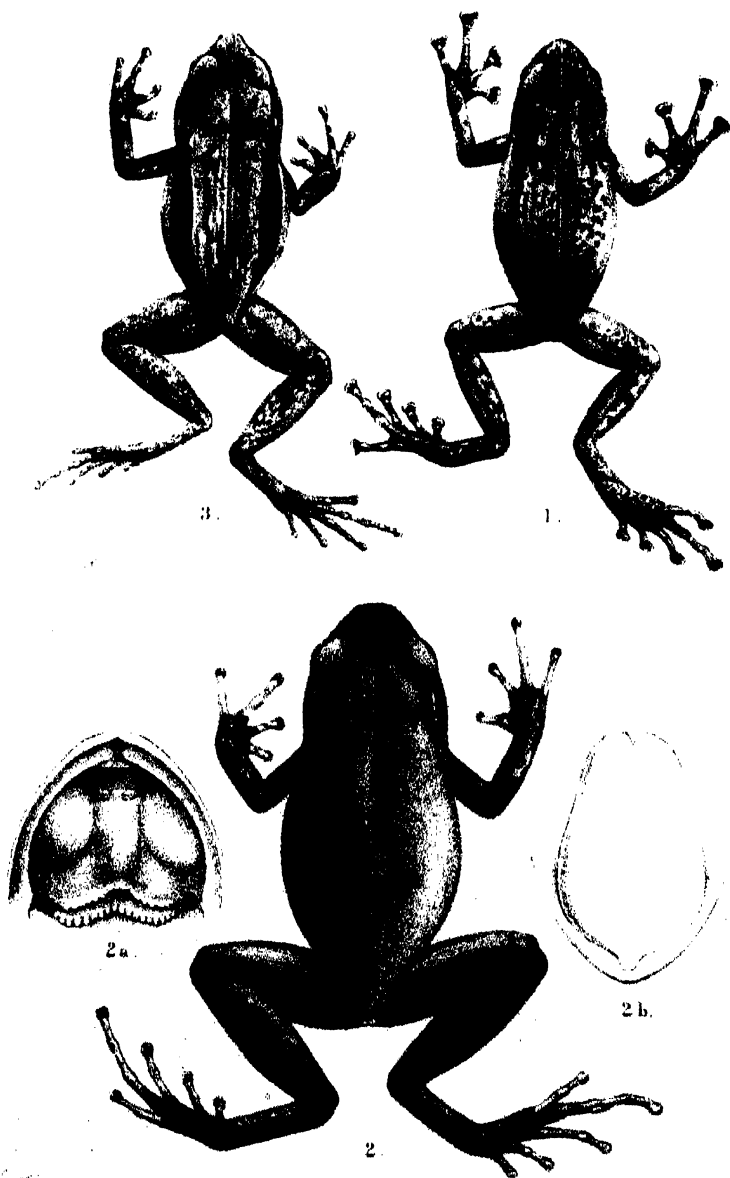
PRINTED BY TAYLOR AND FRANCIS,
 RED LION COURT, FLEET STREET.



J. Green del et lith

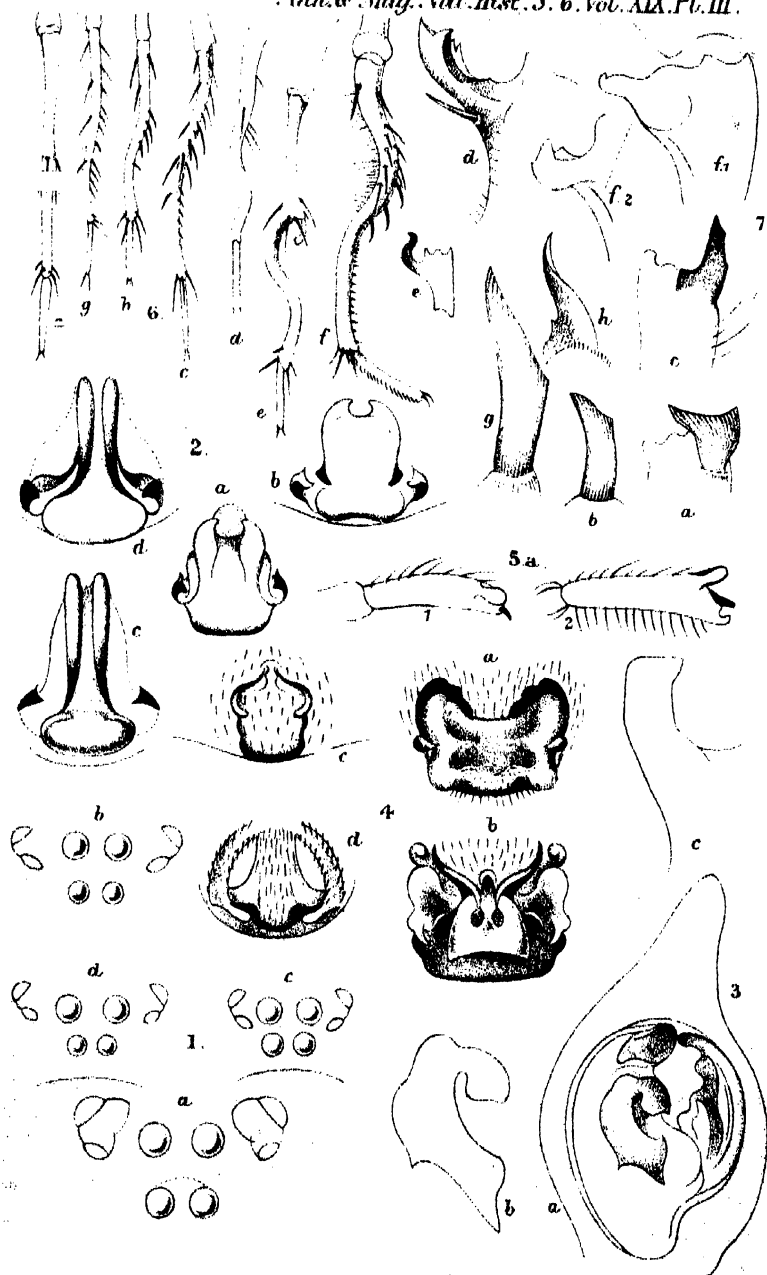
Mintern Bros imp

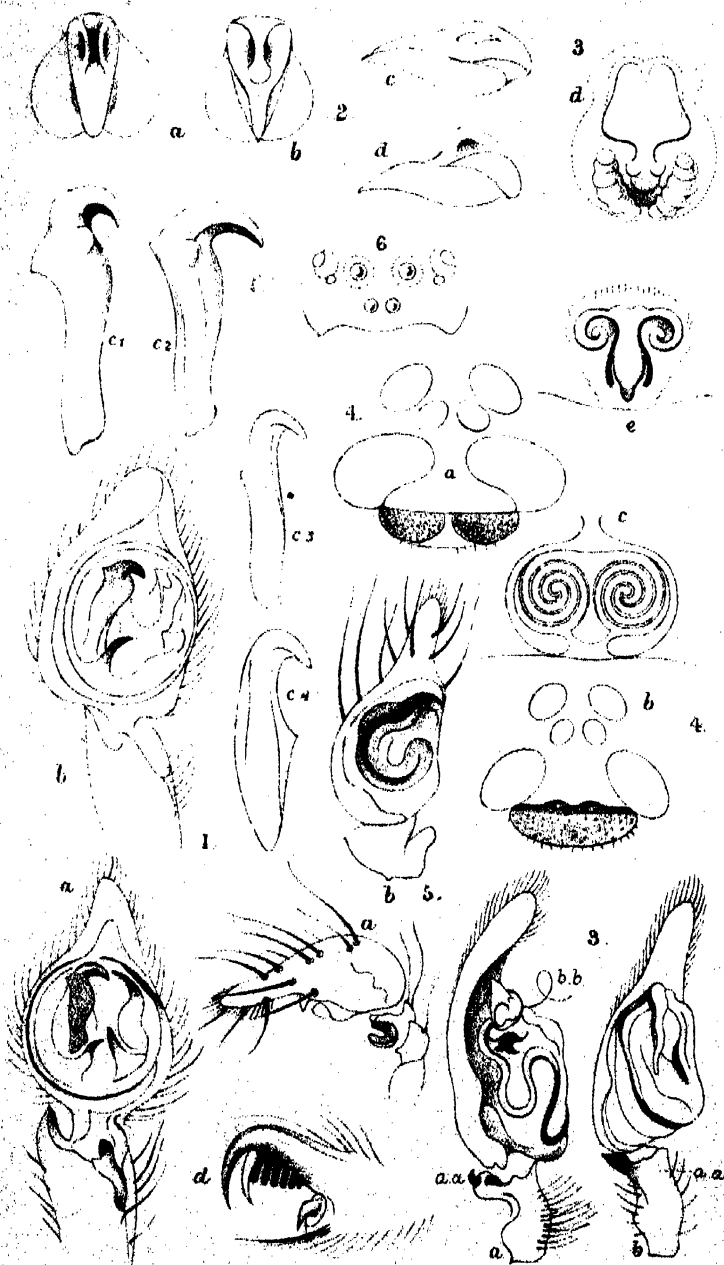
1. *Lygosoma nigrolineatum*. 2. *Lygosoma Stanleyanum*. 3. *Lygosoma elegans*.
4. *Lygosoma iridescent*. 5. *Nyctimantis papua*.

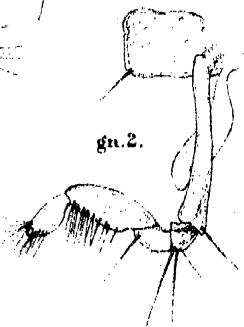
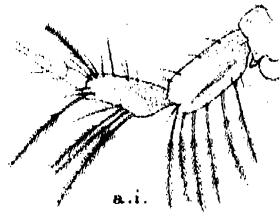
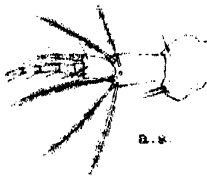


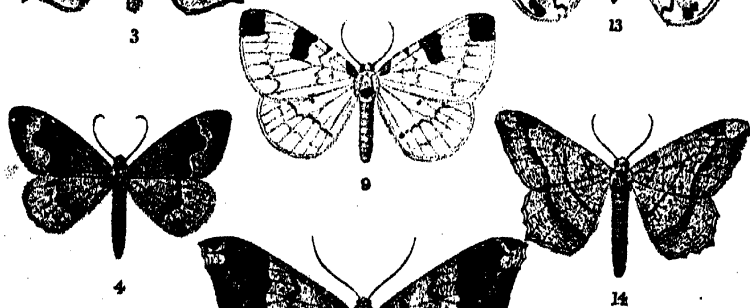
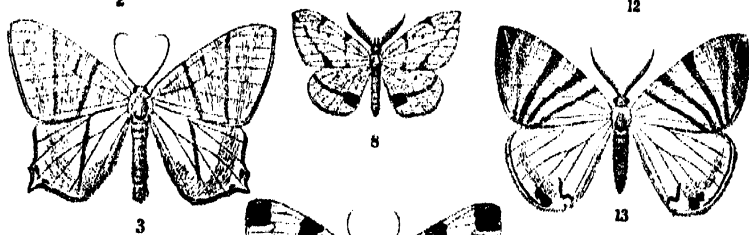
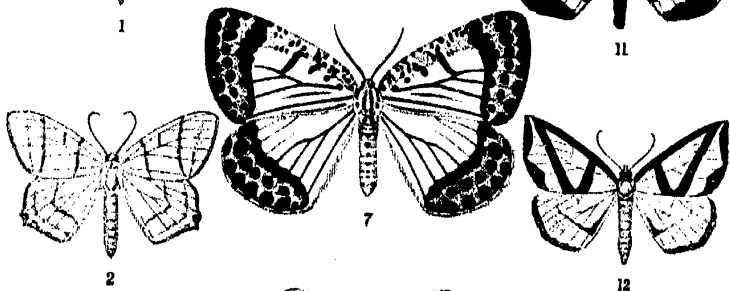
J. Coen del. et lith.

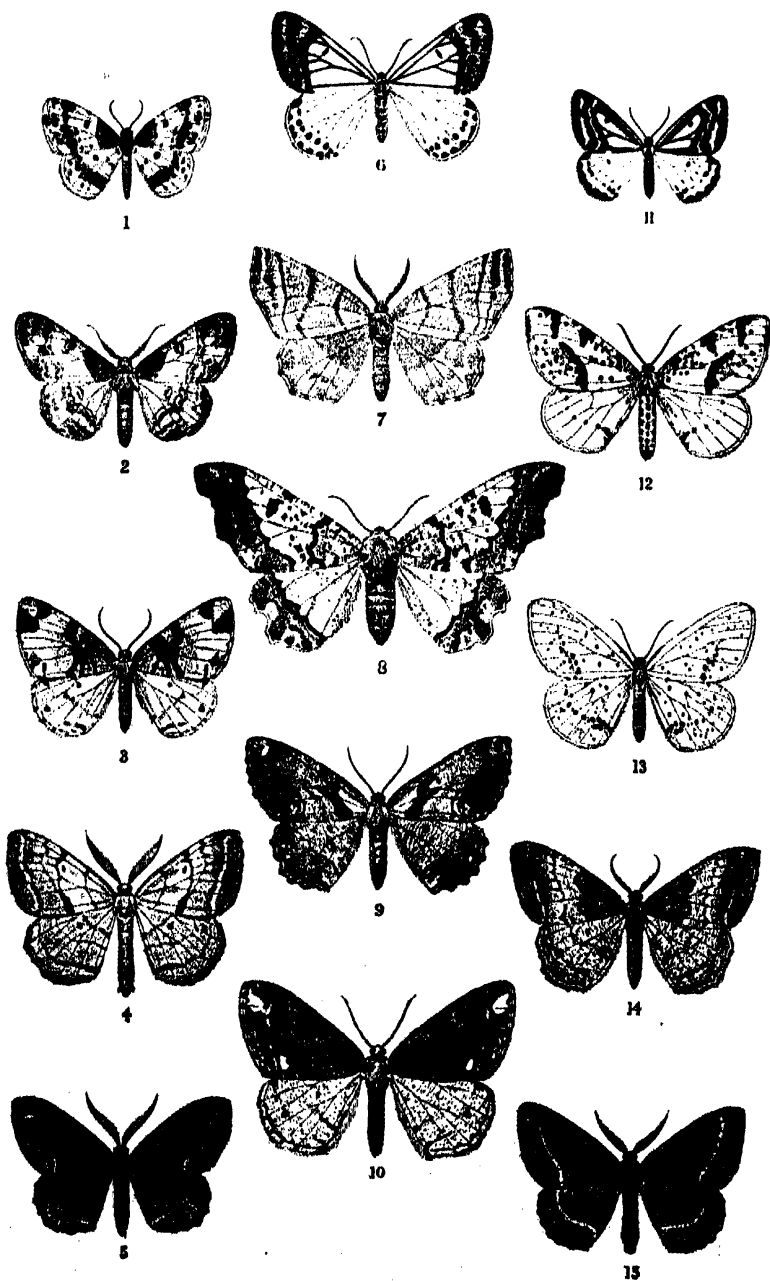
1. *Sphenophryne Anthonxi*. 2. *Liophryne rhododactyla*.
3. *Mantophryne lateralis*.

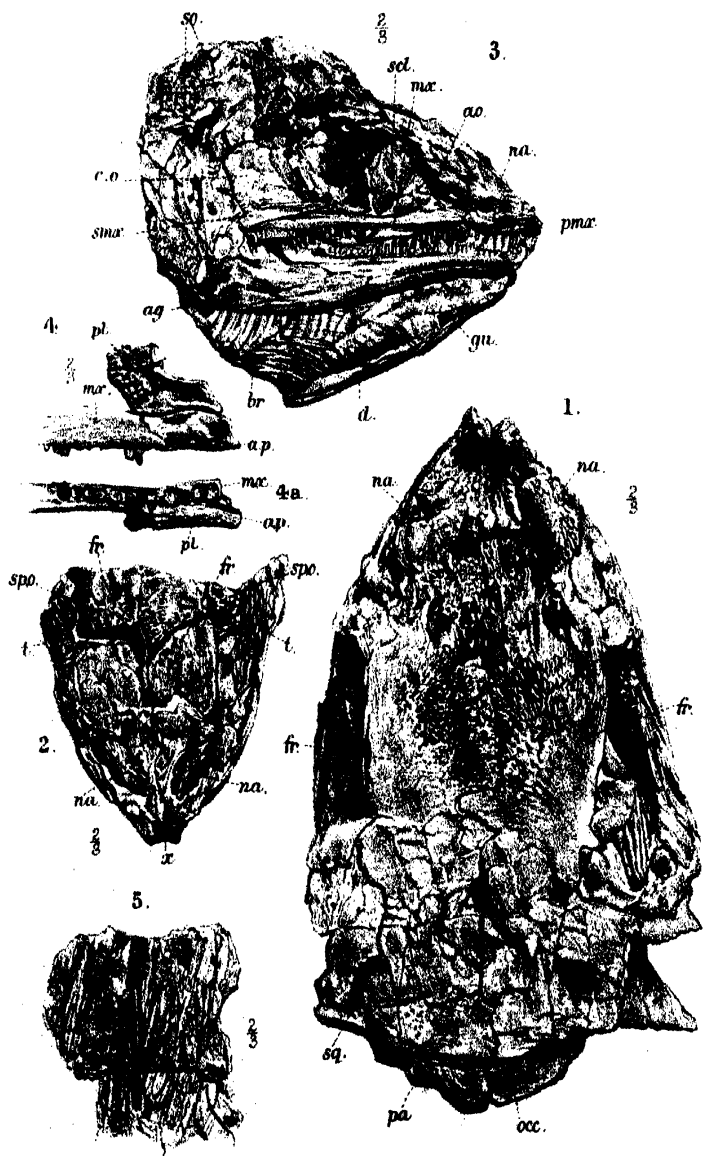










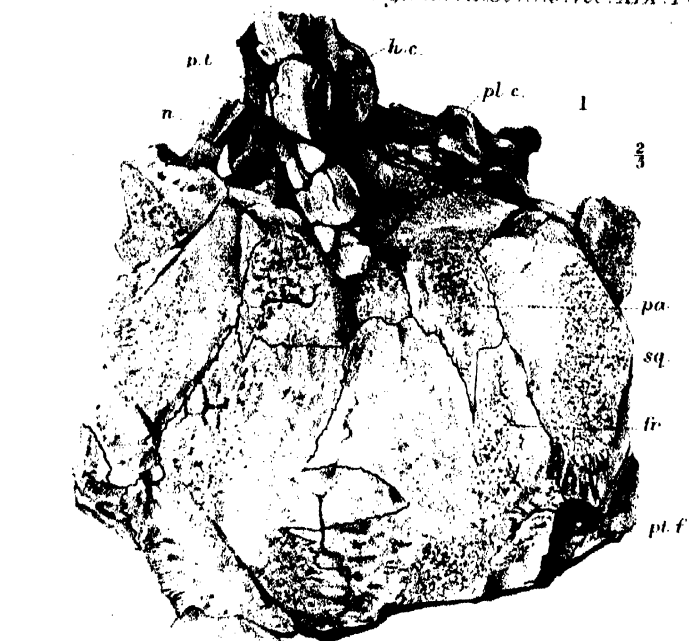


3. Dorsal vertebra

CATAPROS

Manuscript copy

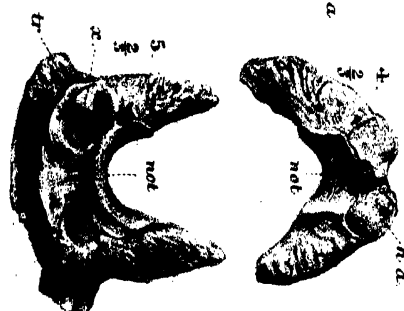
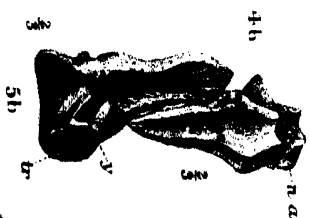
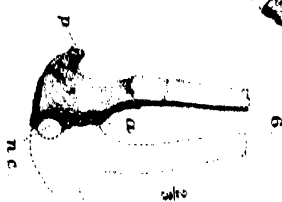
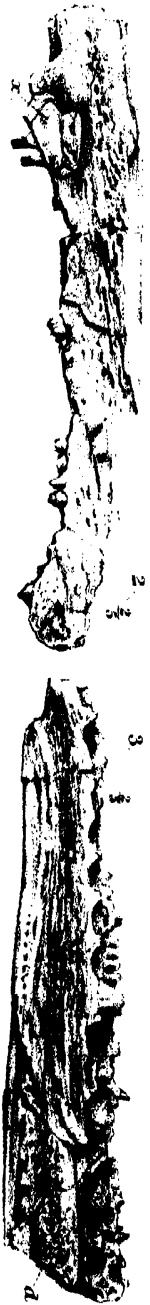




J Green del. et lith.

Muttern Bros. inv.

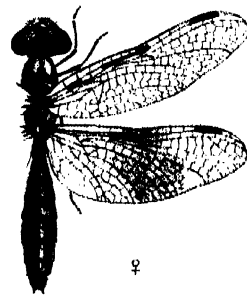
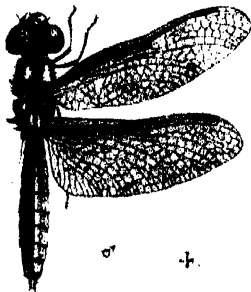
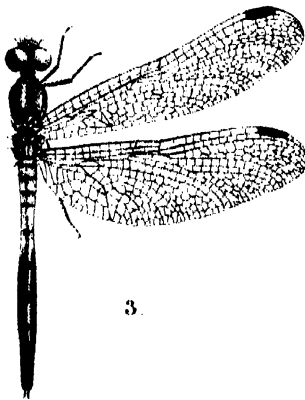
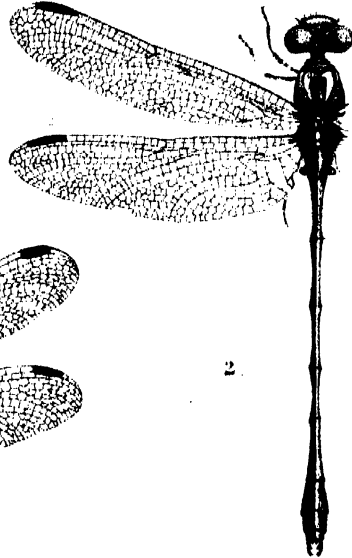
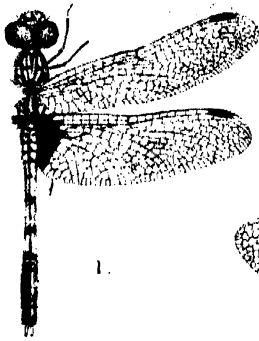
OSTEORACHIS

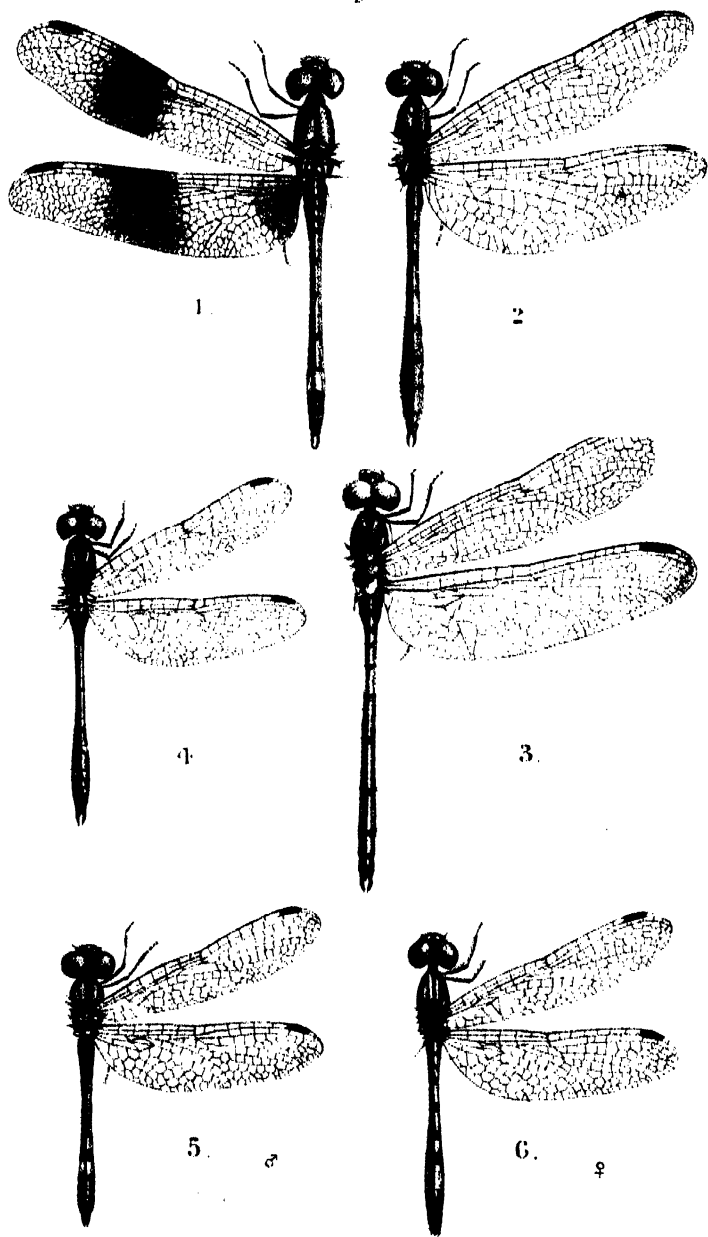


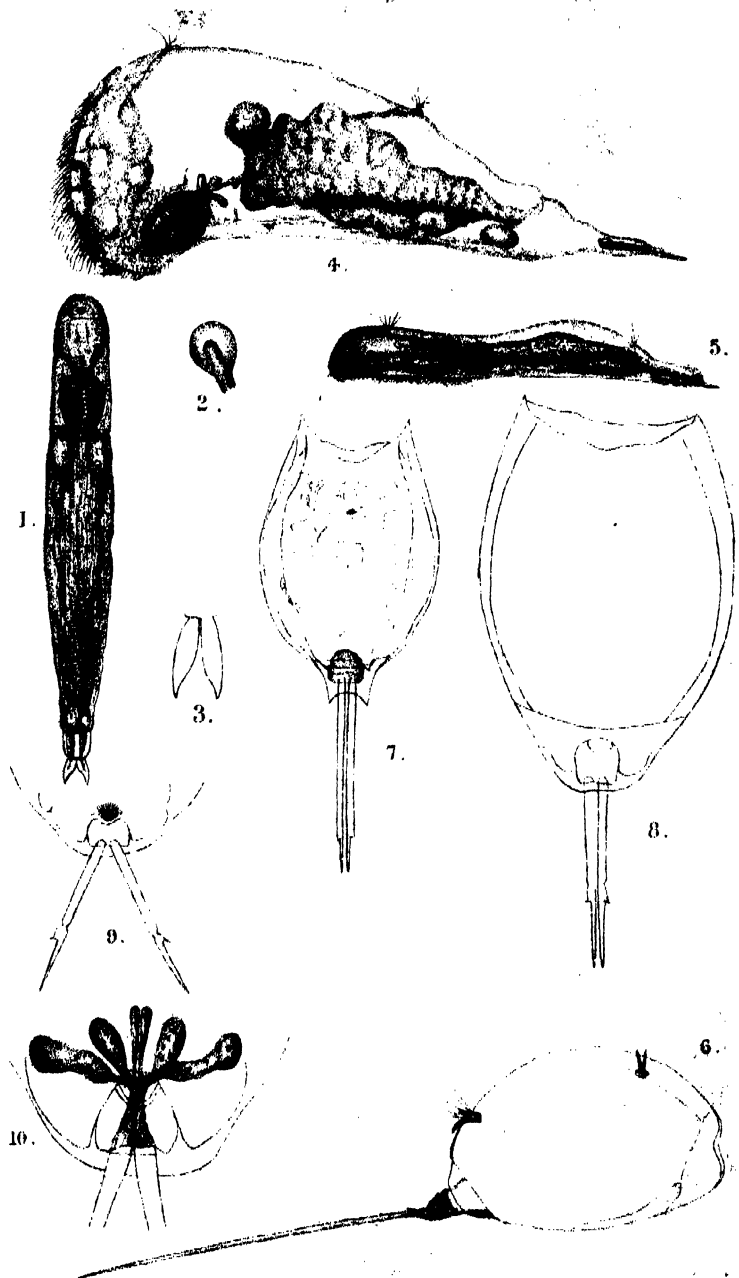
OSTEOCHYSIS.

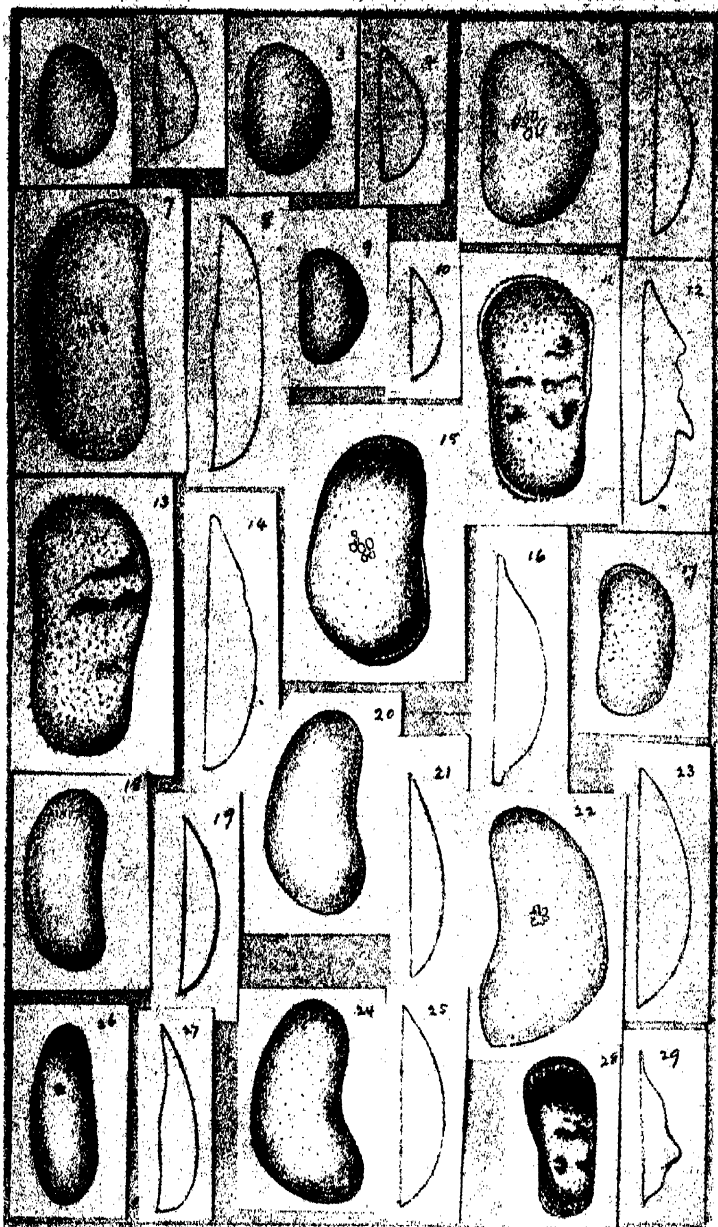
Fig. n

Anterior Prox imp





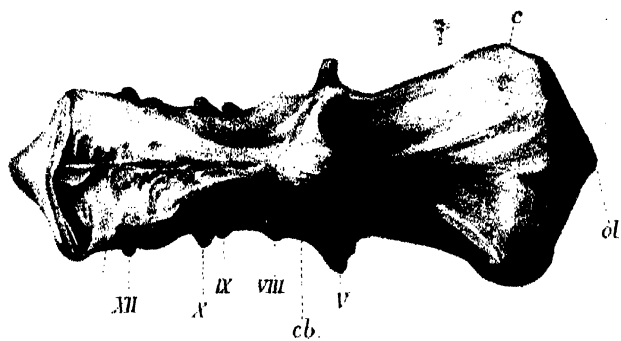




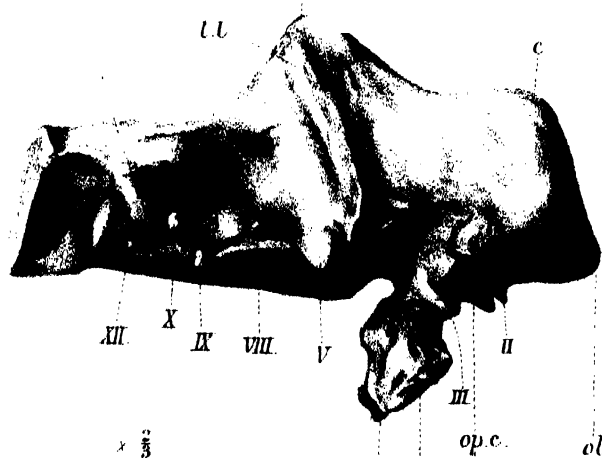
PLEISTOCENE OSTRACODA FROM HITCHIN.

1

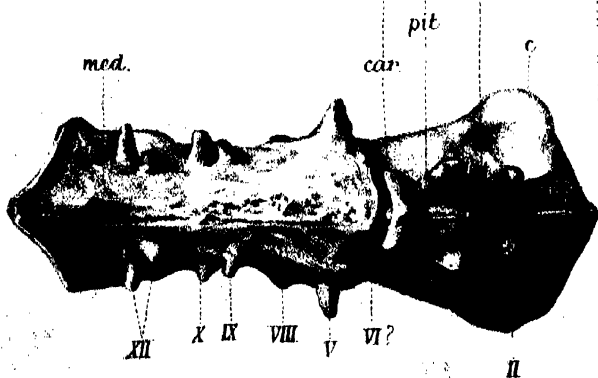
2



med.



$\times \frac{2}{3}$



med.

car.

Green, del. et lith.

Ministry Bros. imp.

CAST OF BRAIN CAVITY OF IGUANODON.



10



1



5



4



1



7



1



3



2



6



8



9

N. E. Mintern del. lith.


Mintern Hoo. imp.

I. A. B. I. 75.

IMPERIAL AGRICULTURAL RESEARCH
INSTITUTE LIBRARY
NEW DELHI.

~~Date of issue~~

3 JUL 1972

16883942  |